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THE JOURNAL OF THE NATIONAL DENTAL ASSOCIATION

1921

President's Address—*Friesell*

Formation of Root-Canals in Human Teeth—*Hess*

Impaired Function as a Result of Closed Bite—*Monson*

The Rational Status of Radiography in Dentistry—*Simpson*

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LOS ANGELES
WOMAN'S
DENTAL
SOCIETY

THE JOURNAL
OF THE
National Dental Association
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Original Communications

PRESIDENT'S ADDRESS

By H. E. FRIESELL, B.S., D.D.S., LL.D., Pittsburgh, Pennsylvania

(Read before the National Dental Association, Milwaukee, Wisconsin, August 15-19, 1921)

WHEN we consider that practically all that constitutes modern dentistry has been produced during the lifetime of men still living we are filled with pride at the development of our profession. When we contrast the condition of dentistry even so recently as twenty years ago with the stupendous developments shown in every field of the science and art at this truly great convention we are filled with amazement at what has been accomplished and with wonder as to what the future may have in store.

The importance of good dental care to the health and happiness of the people has come to be appreciated only in the last few years. Heretofore the prevalent conception of dentistry was that it was solely a mechanical art requiring but a moderate amount of finger skill and delicacy of touch. Today it is acknowledged that upon no other branch of the healing art are medicine and surgery so dependent, for many systemic ailments baffle all the efforts of medicine until the mouth is restored to a healthful condition. Much surgery of the face and jaws would be of little service without dental assistance; and the wonderful plastic, facial, and oral surgery performed in the Great War would have been utterly impossible without the aid of skilful dentistry.

The first dental association that was national in scope, the American Dental Association, was organized in 1859; it was followed a few years afterward by

the Southern Dental Association, which later became known as the Southern branch of the American Dental Association. These two organizations existed until 1896, when they gave up their charters and their memberships merged to form the National Dental Association.

It gives us all much pleasure to have with us Dr. Richards, of Knoxville, Tennessee, who presided over the last meeting of the Southern Dental Association and who with many of our confreres from the South will participate with us in celebrating this twenty-fifth anniversary of the National Dental Association.

The remarkable growth of our Association during the past eight years must be truly gratifying to all who have had any connection with organized dentistry. When the reorganization of the National Dental Association took place at Kansas City in 1913, we had an enrollment of eight hundred, and while many of us had faith in the rapid expansion of the organization, no man would have predicted such remarkable growth as has occurred. Today the National Dental Association numbers approximately thirty thousand members, and includes seventy per cent of the dentists of this country, which indicates a more thoro organization of dentistry than exists in any other profession. This remarkable growth has come during the past eight years, and paralleling it in time and scope of development has been the awakening of public appreciation of the importance of a healthy mouth.

May we not justly conclude that such a change in the appreciation of dentistry is largely due to the favorable influence upon dental practice that has come about as a result of the many interests and activities of this great organization?

Significant of the importance of dentistry and of the growth and success of the National Dental Association is the fact that we were so fortunate as to have selected for the celebration of our Silver Anniversary this beautiful city of Milwaukee, whose citizens have received us with such cordial hospitality, and whose dentists have labored so arduously, so harmoniously and so successfully to make this convention a fitting climax to a quarter of a century's earnest endeavor in that great and important field of human service that we call dentistry. Nowhere in this wonderful country of ours is there a city so well equipped for the holding of a convention of this kind. In no other city in America can there be found such a magnificent auditorium, that so fully and so perfectly meets the needs of this great convention. The ample number of commodious and comfortable lecture halls, and committee rooms; the extensive and conveniently located exhibit room, in which a veritable world's fair in the line of dental exhibits is being held, the great number of rooms available for clinics, and the beautiful arena wherein the greatest banquet in the history of dentistry will be held to celebrate the occasion—these things and the fact that they are all under one roof make a setting for the meeting that approaches perfection as closely as the most exacting could ask for, and establish a standard by which our meetings for many years to come must be measured.

While the visible features of the meeting so far excel those of any preceding one, they are not the only things upon which we are to be congratulated. Like the dial of a beautiful clock they are easy to see and to appreciate; but just as we know that back of the dial we must have an intricate and complicated set of wheels, and springs, and machinery, all working in perfect harmony and unceasing faithfulness if the clock is to perform its function, so we find back of all this outward evidence of a great

meeting a group of faithful workers who have shown the same loyalty, efficiency, and ceaseless energy as the wheels and springs of the great clock. I am indeed fortunate and deeply appreciative of the splendid work that has been done by the men composing the local committees. Without the slightest disparagement of the best set of workers who have had charge of preceding meetings, I can conscientiously say that no president of this Association up to this time has had more tireless, earnest, efficient and enthusiastic local committeemen, and fortunate will be my successor who will find their equal. No one who has not been behind the scenes and taken apart the machinery of a clock like this can appreciate the sacrifices these man have made thru the past year to make this a successful meeting, and no words that I can say can convey to them the fulness of my appreciation and my gratefulness for their splendid assistance.

To Drs. Charles W. Hall, Otto G. Krause, E. A. Flancher, William H. Cudworth, Henry G. Morton, Adolph Gropper, Henry L. Banzhaf and E. A. Geilfuss, this Association owes much for the success of the meeting.

An inspection of the program indicates that the officers of the various sections have been equally faithful in the performance of their duties. The character of the papers and the high standing of the essayists, the great number of clinicians and the wide scope of the clinics stamp this the most ambitious program this Association has ever presented.

The banquet is a fitting climax to a quarter of a century of sincere effort to advance the science and art of dentistry, and this meeting closes the most successful year of that period. The reports of the Secretary and the Treasurer as well as those of the various standing committees and commissions which were read in the House of Delegates, give us an excellent idea of what a great work this Association is doing and amaze us with the magnitude that our interests have assumed. In fact the Association has grown so great that the responsibility in connection with one of these meetings is becoming quite a serious matter, and there are at present but few cities in this country that are capable of adequately housing a convention of the National Dental Association. When we sum up the aggregate expenditures of the members who attend one of these meetings, the expenses of the exhibitors and the general expenses of the Association, it amounts to more than a million of dollars. This in reality is a contribution by the dental profession to the public welfare, because our members attend these meetings in order that we may render better services to our patients.

At this point I desire to commend our secretary, Dr. Otto U. King, for the thoro and efficient manner in which he has performed the arduous duties of that office. The duties of the secretary's office have become so complicated that it requires an exceptionally capable man to carry on this work satisfactorily, and this Association is fortunate in having a man of Dr. King's executive ability who is willing to give up general practice and devote all his energies to this work.

The secretary's report made reference to the narrow financial margin upon which the Association has been doing business, and while recognizing this condition it rather questioned the wisdom of an increase in dues. To this conclusion I take exception. It is unwise to attempt to conduct, upon such a small capital, a business so large as ours has become. The annual dues of two dollars is a ridiculously small sum to pay for membership in this organization, whose influence thru the education of the public to the importance of good dentistry adds more each day to the income of the most lowly practitioner than the cost of an annual membership.

My opinion is that our annual dues

should be at least $5.00 and then the Association could do some real work in public education and professional progress. Unquestionably it will be necessary to increase the dues at least $1.00 per year in the near future, for the work and the responsibilities of the National Dental Association are increasing with a rapidity that few of us realize. There are many desirable avenues of endeavor awaiting the action of this Association, but these cannot be pursued until an adequate administrative organization is built up, and such cannot be done on the present inadequate income.

The business connected with the conducting of an annual meeting has become so extensive that financial embarrassment might easily result from inexperienced management, and it is no longer permissible to attempt to run an immense convention of this kind without adopting a safe and sound business and financial policy. Believing that to be essential the local committeemen, and myself, one year ago, adopted such a plan, and we feel confident that the business report of this meeting which will be made by the Local Committee of Arrangements will amply demonstrate the wisdom of this action. I might say that the establishment of a central business office by the Local Committee, the handling of all correspondence and business thru that office, and the election of a treasurer for the Local Committee to receive and disburse all moneys has proved extremely gratifying and economically sound. The accounts of the Local Committee are in such excellent condition that a complete report can be made up to August 1, and within a few days after the close of the meeting a complete report of the committee's work for the past year will be forthcoming; the accounts have been audited by a certified public auditor, and not only has every penny that has passed thru the committee's hands been accounted for, but it has been distributed to the proper departments, so that future local committees may have something by which to be guided in their operations I recommend to the Board of Trustees that this plan or something similar be required in the future of all Local Committees of Arrangements.

There are certain matters of major importance which should be referred to. First among them is the Research Institute. Like the proverbial dark cloud, this matter which has caused much concern during the past turned out to have a silver lining, and while the particular objective aimed at by the Institute in Cleveland was not attained, it is certainly pleasant to find that what threatened to be failure has resulted in the equivalent of an endowment in perpetuity of $200,000.00 to dental research, for that is just what it becomes within ten years. Dr. Weston A. Price is to be heartily congratulated upon the happy outcome of his many years of trial and tribulation over this matter. Thus has a worthy effort been well rewarded.

The question of legislation, it seems, we have always with us. If it isn't army or navy legislation, it is the tariff. Last spring at the most inconvenient time your officers were notified of tariff measures at Washington which demanded their immediate attention. Several days of unpleasant conferences resulted, with doubtful promise of success. Fortunately fate and the adjournment of Congress saved the day. When all were busily preparing for this meeting, the tariff fire alarm sounded again, and for awhile it seemed as if the duty on dental instruments would be advanced from 60 per cent to 300 per cent, making it possible for a greedy manufacturer to exploit the dental profession by increasing domestic prices in accordance therewith.

Believing that this matter should be fought to the finish, and believing also that the American manufacturer might be amenable to reason, it was decided to

ask for a conference before opening hostilities. Accordingly this conference was called and held in Cleveland on July 30. It was attended by the president of the Dental Manufacturers' Club, the president of the Dental Trade Association, and representatives of several of the largest manufacturers of dental goods, as well as the Secretary of the National Dental Association and the members of the Committee on Legislation and myself. After a thoro discussion of all sides of the question it was unanimously agreed by all present at the conference: (1) that the manufacture of dental instruments was not an infant industry and should be divorced from the manufacture of surgical instruments in the Fordney Bill; (2) that the specific duty of 60 cents per dozen was not needed; and (3) that a 35 per cent ad valorem duty based on the American valuation would amply protect the American manufacturer and workman against undesirable foreign competition.

The manufacturing interests represented agreed to approve such amendments to the Fordney Bill, to take a telegraphic vote of their Association upon the matter, and authorize our Committee on Legislation to notify the Senate Committee having the matter in charge that the manufacturers and consumers were in agreement on the proposed amendments. The wire vote was successful, and the Senate Committee was so notified. I believe that this effort at arbitration has saved much time and expense on the part of our Association, and should be productive of a much better understanding and more cordial feeling and co-operation between the dental manufacturers and the dental profession.

In his presidential address last year Dr. Conzett recommended the appointment of some committees to take up the matter of study clubs. Further study of the subject has prompted the organization of a Department of Extension Study Clubs with a director and secretary to co-ordinate the work and with twelve committees assigned to as many divisions of graduate study. It is hoped that this department may be able to exercise desirable supervision of this type of professional activity, directing it intelligently along proper lines and assisting in the development of study clubs thruout the country. Dr. J. V. Conzett has been appointed director and Dr. J. F. Biddle, secretary of this work.

In my efforts to attend the numerous state society meetings to which I was invited during the year I became keenly aware of many conflicting dates and I wonder if some plan might not be devised to overcome a situation which must make it extremely difficult for some societies to secure the desired essayists, clinicians, and exhibits.

The publication of the first volume of the *Dental Index* in January was a notable contribution to dental literature. It is hoped that the Research Commission may be able to assist in the publication of the Index for previous years and that the National Dental Association may see fit to finance the paper back Index which the Bureau is preparing for the current year. The value of this work in literature and research is self-evident.

Splendid work has been done by Dr. Rea P. McGee, thru the pages of *Oral Hygiene* in eliminating much of the abortive matter that has been passing for authentic dental information in the physiologies used in the public schools. The authorities of some states have taken up the matter and demanded that the right kind of information regarding the teeth and mouth be presented in the school physiologies before they will be accepted.

The prevalence of incompetent lay radiographers, who presume to give diagnoses of dental diseases without any qualifications for such work, causing

much annoyance to dentists, and not infrequently serious results to patients, has become a menace that demands some action on the part of this Association. The state of Pennsylvania has passed a law recently making it illegal for anyone other than a physician or dentist to take a skiagraph of the teeth and make a diagnosis of the same. Some action on this matter should be taken at this meeting.

The past year is marked by two new factors that must influence dental education, and thru it American dentistry. The Carnegie Foundation for the Advancement of Teaching some months since announced that, as one of a series of studies on various phases of education it was about to enter upon a comprehensive survey and study of dental education. Since the method by which it was originally proposed to take up this study was not acceptable to the representatives of the three parent dental organizations (the National Dental Association, the National Association of Dental Examiners, and the National Association of Dental Faculties), it has been modified. An officer of the Carnegie Foundation in conference with the Dental Educational Council has asked its co-operation and guidance, and the Dental Educational Council finds itself both willing and desirous to assist in an undertaking that aims to bring together, first of all, *the facts* concerning dental education, to be used as a basis upon which decisions may be reached as to the best way to assure the continued progress of the training for our profession.

The co-operation of these two educational forces, the Carnegie Foundation for the Advancement of Teaching, and the Dental Educational Council, should prove of great value to dentistry, not only in America but also thruout the civilized world.

Beginning with the next college year of 1921-22 a number of the dental schools will demand one year of college work as a requirement for entrance. While I see no objection to such a requirement or a still higher one being made by any dental school whose local conditions and individual preference seems to indicate the desirability of such action, my intimate knowledge of existing conditions constrains me to caution the dental profession against countenancing any attempt to make such a requirement obligatory upon all dental schools at this time It is not practicable to establish a minimum standard for every school and for the entire country that is reasonably adapted for some schools and for certain sections only.

Reliable statistics for more than a decade past show that from death, from change of profession, and from other causes there is now an annual loss of approximately nineteen hundred members of the profession. For the three years 1920, 1921, and 1922, class enrollment and graduation statistics indicate that there will be an approximate decrease for these three years of from twelve to fifteen hundred dentists. This great divergence between loss and gain during these current years is due primarily to the fact that all the schools changed at the same time from a three-year to a four-year course, and in addition this was somewhat accentuated by the exigencies of war. If all the schools were to be obliged to change coincidentally from a high-school entrance to a pre-dental year requirement we should again have a year or two when additions to the profession would fall far below the average. If by such reasons we should force within the present decade a recurrence of the low annual average of additions thru which we are just passing, the cumulation of these two depression periods within a single decade would very seriously diminish the total practicing profession of the country. If, on the other hand, the change in entrance requirements is distributed in

different schools over a series of years, the curve of annual output will not be irregular.

The dental profession should not lose sight of the fact that more preliminary preparation alone does not assure better professional training. It is only when higher entrance requirements are supported by a corresponding improvement in the quality of the professional course that we will get the full meaning of higher standards.

Some schools now lack teaching efficiency commensurate with the capability of the average high-school graduate. Many schools will do well to give attention to strengthening the dental course before they demand greater preliminary education. It is possible that advance of entrance requirements may be used as a smoke screen to conceal a professional course of low efficiency.

The dental profession of each state that has a state university may well insist that it is the duty of the state to train the dentists to care for the health of its people, just as it is its duty to train its teachers, lawyers, and physicians. It is unworthy of the citizenry of one state to be a parasite upon the institutions of another state to secure training of dentists which it should itself afford.

The dental profession in its daily contact with its clientele may well nurture the idea that dental education is a proper object for private philanthropy as well as education in the arts and sciences.

Whether it is desirable to establish a pre-dental year in any but the most favorable localities may be seriously questioned. The class of 1921 is the first product of the four-year course, and considering the interference in the work of this class caused by the war and the conditions following it, additional time to observe the efficiency of this course might reasonably be expected. The reports of the teachers in our schools and of the examining boards which have examined the graduates of 1921 are to the effect that the product of this course far excels the graduates of preceding years.

At present there is one physician to each 800 persons in this country, while there is but one dentist to each twenty-five hundred people. Many towns with populations of several thousands have but one dentist or perhaps none at all. In one state there are fourteen counties without dentists, and twenty-one other counties with but one dentist in each. The number of dentists, of dental students, and of dental schools is wholly inadequate to meet the needs of our present population. The annual increase in population is itself out of proportion to the yearly increase in the number of practicing dentists, and the results of the many agencies by which the dental education of the people is being carried on only serve to increase the demand for dentistry and accentuate the shortage of dentists.

One of the outstanding problems of the dental profession today is how to make good dentistry more available to the people. It cannot be done by making dental education more difficult to obtain. Continued education of the people in the importance of dental care, accompanied by continual juggling with the standards of dental education, can only lead to disaster. It is possible to put too much steam in a boiler. There is no room for a dental aristocracy in America.

FORMATION OF ROOT-CANALS IN HUMAN TEETH.[1] II

By WALTER HESS, M.D., D.D.S., Zurich, Switzerland

Upper First and Second Molars

In the upper bicuspids we noticed a wide differentiation in the form of the root-canals, but in the upper molars there is also a variety in the number and form of the root-canals, thus complicating the picture greatly. There are usually three roots present, of which one lies lingually and the other two on the buccal. The lingual root is usually the largest and rounder in form, while the mesio-buccal root is usually wider than the disto-buccal root and externally it not infrequently exhibits a longitudinal groove on the mesial and distal, as well as a flattening mesio-distally and a pointed apex. In rare cases four roots may be found. The fourth root appears to originate from the mesio-distal root and only shows rudimentary development (Moral).

The root-canals leading from the pulp chamber are in conformity with the roots, and in case of a fourth root there is also a separate fourth canal. Since formerly the number of root-canals were described as three, Preiswerk and then Fischer were the first to indicate that the mesio-buccal canal had a wide differentiation. Moral then called attention to a fourth canal, which he also described in its various forms. By means of my own observations I am able to verify the results of Moral.

Just as Muehlreiter described the formation of two canals in lower molars by means of the addition of dentin, we must assume the formation of two mesio-buccal canals in upper molars by the physiological addition of dentin, since the origin of the fourth canal from the lingual canal is excluded by this assumption and there is no independent origin (Moral). I am inclined to assume, in the majority of cases, a division of the mesio-buccal canal into two occurs in a physiological manner. Two canals will be found if the two longitudinal grooves are present on the mesial and distal of the root which compresses the root mesio-distally. By means of the grooves walls are driven inward into the lumen of the canal whereby a very fine split or even a complete separation of the canal into two results by the formation of new dentin.

The mesio-buccal canal in half the cases occurs as a simple flattened canal running to the disto-buccal from the pulp chamber to the apex. During youth these canals are simple and undivided (Plate XIII a, 1-17, Plate P l, 1 and 2). As age advances a division of the mesio-buccal canal becomes noticeable. The division may begin near the pulp chamber and again unite in the apical third, ending as one simple canal at the apex, or the divided canals will again unite and finally end in a forked manner at the apex with independent openings. Numerous divisions of the canal may occur in which the canals at first divide and then reunite at different levels of the root, resulting in a number of connecting canals lying one above the other, similar to conditions found in the upper bicus-

[1] "Zur Anatomie der Wurzelkanale des menschliches Gebisses," *Schweizerische Vierteljahrsschrift fur Zahnheilkunde*, 1917. Translated by Newton G. Thomas, A.B., M.A., D.D.S., and Herman Redlich, Chicago, Illinois. Part I of this article, which is here concluded, was published in *Jour. Nat. Dental Assoc.*, VIII (September, 1921), 704.

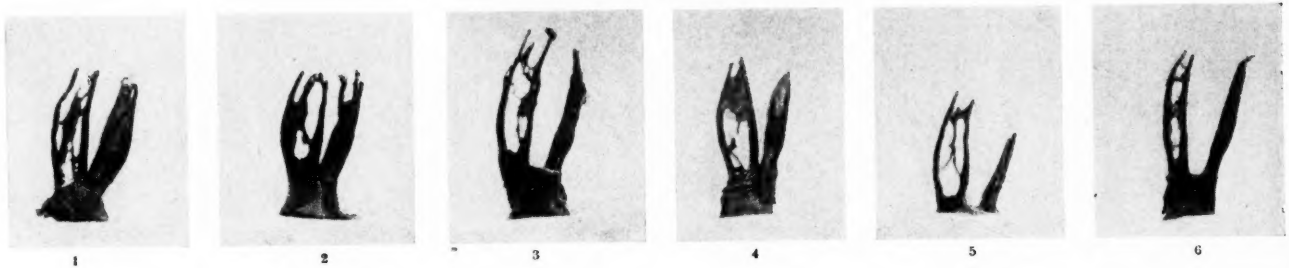
Plate E 1

1 2 3 4 5 6

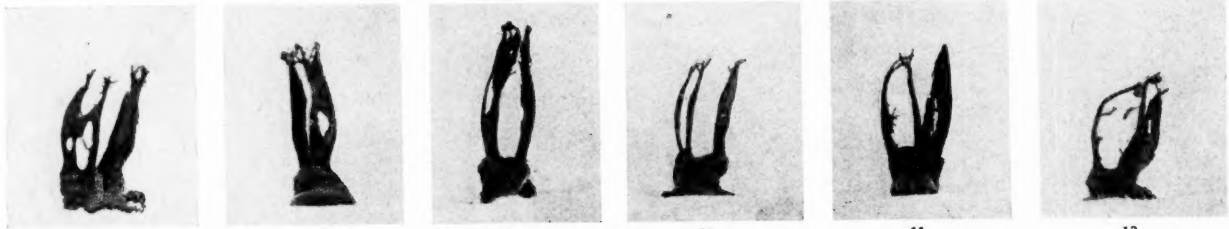
7 8 9 10 11

Lower First and Second Molars

Plate E 2



1 2 3 4 5 6



7 8 9 10 11 12

Lower First and Second Molars

Plate E 3

1 2 3 4 5 6

7 8 9 10 11

Lower First and Second Molars

Plate F 1

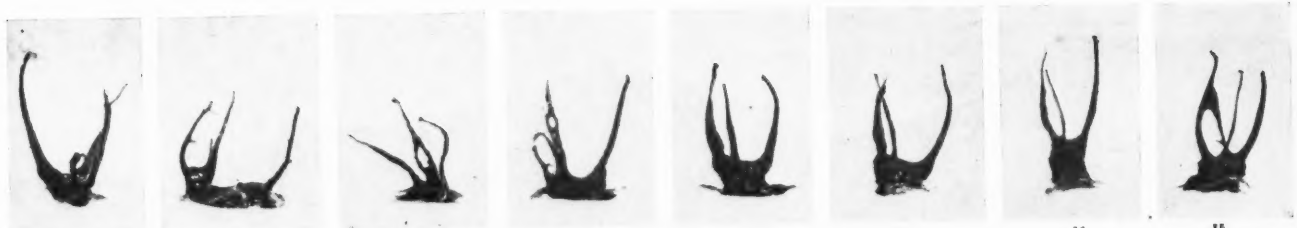
1 2 3 4 5 6 7

8 9 10 11 12 13 14

Upper First and Second Molars

Plate F 2

1 2 3 4 5 6 7



8 9 10 11 12 13 14 15

Upper First and Second Molars

pids (Plate XIII a, 25-36, Plate XIII b, 27-64, Plate F 1, 1-14).

Besides the various divisions of the mesio-buccal canal, there are also numerous apical ramifications and marrow canals which add to the complications. The finest apical ramifications are most numerous at the apex of the mesio-buccal root and are from four to six in number, arranged tuftlike (Plate d, 8, Plate h, 16, Plate g, 14, Plate i, 9, Plate P 1, 5, 6, 7, 11, 13, Plate XIII a, 28-36). Moral in his observations noticed that 63 per cent of the mesio-buccal canals divided into two, not including the end branches or apical ramifications. He called attention to the fact that the mesio-buccal canal exhibits these divisions into two canals and not the disto-buccal, as Fischer states. I am to verify Moral's results with respect to the statement that the mesio-buccal root is more often found divided than is the disto-buccal, which was already determined by Preiswerk. I was able to find only 53 per cent of the mesio-buccal canals with a division into two; apical ramifications were present in only 60 per cent, which coincides with Fischer's results. I was unable to find a fourth canal which ended in a lingual canal in my specimens, altho the source I often found to lie very near that of the lingual root-canal; it seems to me that the formation of a fourth canal may be explained in most cases as the result of an addition of dentin within the mesio-buccal root.

The disto-buccal canal is built much more simply and its volume is somewhat greater than that of the mesio-buccal canal. Mesio-distally it is somewhat flattened and usually continues to the apex as a simple canal where it splits up into apical ramifications. Here and there are indications of a division of the canal, as for example in Plate F 1, 11. The apical ramifications are least in the distal-buccal canal and never extend above 10 per cent.

The lingual or palatinal canal is the largest of the three root-canals of the upper molars. It has a straight course and gradually tapers toward its apex, giving off marrow canals to the peridental membrane here and there. Apical ramifications are found in 20 per cent of them. In advanced years the number of marrow canals and apical ramifications decrease in all three root-canals. Here and there a number of fine marrow canals were found on the traylike surface at the base of bifurcation of the pulp chamber, as they were described by Fischer (Plate F 2, 3). Table 10 summarizes the conditions present in the upper first and second molars.

The Lower First and Second Molars

Just as the upper first and second molars exhibit highly complicated forms of their root-canals, so also the lower first and second molars show a great variety in form and number of their root-canals and awaken our interest in the extensive differentiation in structure of both roots.

The lower first and second molars usually possess two roots which lie one behind the other, the one mesial and the other distal. The distal root is usually somewhat smaller and more round in form, while the mesial root often is quite flattened and grooved longitudinally on the mesial and distal. Only in rare instances do the mesial and distal roots unite to form one compact mass. The occurrence of a third root is rare and, according to Muehlreiter, occurs only in the lower first molars. When present it always lies lingually, usually branching off from the distal root, and corresponds to the root designated as *radix praemolarica* by Bolk. Not infrequently the mesial root occurs with two apices.

According to Bolk there also may occur a splitting of the mesial root of the second lower molars having a *radix praemolarix* so that three anterior roots may persist. There may be a splitting of the mesial and distal roots resulting

in a four-rooted tooth but this is very seldom.

As a rule there are three root-canals in the lower first and second molars of adults, namely two separate mesial canals which may be connected by splits or connecting canals and a larger centrally placed distal canal. In teeth in which the growth of the root has not yet been completed the mesial root will be found to have one large canal running from the pulp chamber to the apex and much compressed at its middle. The distal canal likewise is very wide, having a much rounder form and being slightly compressed mesio-distally (Plate F 1, 1-6, Plate VII a, 1-15).

After a completed formation of the root, differentiations occur in the mesial root which lead to the formation of two mesial root-canals so that three root-canals are present in all (Plates VII b and VIII a, Plate E 1, 7-11).

According to Muehlreiter, the division of the mesial canal into two is explained as follows: During the formation of the mesial root the walls corresponding to the external grooving lie so close to one another at the center that sooner or later the formation of new dentin will separate the canal into two almost completely; however, there are exceptions. In older teeth it is frequently possible to trace a fine microscopic split between the two canals in transverse sections of the root, since a complete fusion of the two walls is seldom and only occurs when an external splitting of the root is present.

The compression of the distal root is so slight and the walls are far enough apart to prevent a fusion which would result in two separate canals, even when the walls have attained their full thickness. However, if this does occur in exceptional cases the tooth concerned would have four root-canals.

Port has verified the results of Muehl-

TABLE 10. THE UPPER FIRST AND SECOND MOLARS

Age	Number	Number of Root-Canals					Number of Apical Branchings				Percentage	Number of Marrow Canals					Percentage
		1	2	3	4	5	2	3	4	5		1	2	3	4	5	
15-25	98	....	....	48	50	....	Mes. 5 Dist. 2 Pal. 3	5 3 4	....	....	10 5 6.5	10	1	....	....	....	9
25-35	240	....	....	120	120	....	Mes. 40 Dist. 15 Pal. 20	30 4 20	50 5 8	....	50 10 20	32	2	....	....	....	10
35-45	126	....	....	50	77	....	Mes. 10 Dist. 8 Pal. 12	30 4 9	25 4	....	51 10 20	23	2	....	....	....	11
45-55	48	....	....	20	28	....	Mes. 10 Dist. 2 Pal. 2	10 1 3	....	....	41 6 10	15	....	....	....	....	12
	512	....	....	238 46%	275 53%	....	129	123	92	....	67	80	5	....	....	....	16

reiter by sections of 55 young teeth and obtained the results given in Table 11.

In order to verify the results of Muehlreiter and Port, I have examined approximately 80 young lower first and second molars by the "corrosion method" and am able to support the statements

Table 11. Number of Root-Canals

Age	Number	Three-Root-Canals	Two-Root-Canals	Apex Open
6	1	....	1	1
7	4	....	4	4
8	7	6	1	7
9	8	4	4	6
10	12	9	3	9
11	12	10	2	3
12	5	4	1	2
13	6	5	1	-

of Muehlreiter and Port. Between the ages of six and nine, the lower first molars thruout show two canals and likewise in the second lower molars between the ages of twelve and fourteen (Plate VII a, 1-15), In the following years there is a gradual appearance of separating dentinal walls mesio-distally which divide the mesial root-canal into two mesial canals (Plate VII a, 16-27), while the distal canal remains single. Table 12 gives the result of observations between the ages of six and seventeen:

The differentiation of the mesial root-canal continues in the following years by a further separation. The varied stages of division take place. The canals may separate to begin with and again unite below the separating wall and end either singly or divided, or the canals after once dividing may remain so, each ending separately at the apex. In addition, there are numerous intermediate stages forming anastomoses and bridges between the two separated canals (Plates VIII a, VIII b, IX a, IX b, Plates E2 and E3).

Besides these canal systems there are also numerous apical ramifications and marrow canals which penetrate the mesial root substance in addition to the two main canals and form a gratelike interruption in the apical region (Plates E2 and E3, Plates b, 4, g, 13, i, 18).

Table 12. Number of Root-Canals

	Age	Number	Three-Root-Canals	Two-Root-Canals	Apex Open
First Molar	6	....	....	....	....
	7	2	....	2	2
	8	6	....	6	6
	9	8	2	6	6
	10	17	10	7	9
	11	15	9	6	5
Second Molar	12	10	....	10	10
	13	4	....	4	4
	14	8	1	7	8
	15	6	3	3	5
	17	5	4	1	1
		81	29	52	56

The distal root-canal is much simpler in structure than the mesial, of much rounder form, and without special differentiations. Here and there a tooth may be found in which the distal root-canal shows a division, but in that case there is also an external splitting of the root into two. If similar methods of division take place in the distal root-

Plate G 1

1

2

3

4

5

6

7

8

9

10

11

12

Upper Third Molars

Plate G 2

1

2

3

4

5

6

7

8

9

10

11

Upper and Lower Third Molars

canal as in the mesial then there will be four root-canals (Plate E 3, 1, 4, 5). There are also numerous apical ramifications and marrow canals in the distal root-canal, but less in number compared with the mesial canals (Plate D, 7). The volumes of the root-canals decrease upon the increase of age. Out of 136 lower molars examined by Fischer, 26 were free from branchings, the mesial root was branched in 70 per cent and the distal root in 26 per cent. I am able to support these statements of Fischer according to my own observations.

Statements have already been made with respect to the occurrence of a number of root-canals by Chauvin and Port. The latter obtained his results upon examining 491 lower molars. (Table 13).

According to Port no difference exists between the first and second molars. My statements support the results of Port and therefore I have not sorted out the first and second molars in the summary of my observations. (Table 14).

TABLE 13

	Number	Four Canals	Three Canals	Two Canals	One Canal
First Molar	137	9	110	17	1
Second Molar	125	8	96	17	4
Uncertain	229	8	180	35	6
Total	491	25	386	69	11

TABLE 14. LOWER FIRST AND SECOND MOLARS

Age	Number	Number of Root-Canals				Number of Apical Branchings					Percentage	Number of Marrow Canals				Percentage
		1	2	3	4		2	3	4	5		1	2	3	4	
6-17	80	2	36	42	....		5	....	....	....	6					
18-30	210	..	43	157	16	Mes.	60	13	15	26	62	30	5	....	....	16
						Dist.	10	10	9	13	20					
30-40	200	..	19	181	4	Mes.	51	18	25	30	63	24	6	....	....	15
						Dist.	18	10	12	15	27					
40-50	22	..	....	21	1	Mes.	3	5	4	1	60	2	2	....	....	19
						Dist.	1	2	1	2	28					
	512	2	98	401	21		148	55	66	87	73	56	13	....	....	13.5
		0.3%	17.7%	78%	4%											

UPPER THIRD MOLARS

The upper third molars may have two or three roots, and four and five-rooted teeth are also numerous. According to Schmidt, the roots of the upper third molar externally may pass thru all stages of development of either one more

or less rudimentary root, or an excess number. The frequency of this irregularity has been stated by various authors, Zuckerkandl, Muehlreiter, Preiswerk and others. Fischer then showed that this great external irregularity is also retained in the differentiation of the inner pulpal cavity and may result in the most complicated formations. The most common form is the result of fusion of the roots into one mass. In this case there will be one single wide root-canals as the result of the fusion of the several canals and the canal will end at the apex as a simple canal without further differentiations (Plate XV a 2, 3, 6, 9). In addition to this more inner differentiations according to Fischer, since with respect to the apical ramifications they occupy the lowest rank among all molars.

As a rule, we find one to three root-canals which in general show an absence of the more delicate differentiations. Out of 81 examined, Port found 25 with three canals, 48 with two canals, 8 with one canal; while Fischer, after examining 33, found 7 with one canal, 26 with two canals, of which the mesial canal was found to give off 8 branches. In general the lower third shows simply constructed canals. Next to the relatively seldom occurring form with one wide canal and a fusion of the roots, the two-canal form with a mesial and a distal root-canal is the most numerous. The distal canal usually is round without branches, while the mesial canal shows fine ramifications here frequent type, there will occur great variations in forms and numbers of root-canals. Besides the simpler forms of two or three canals, which may be connected by numerous anastomoses and canaliculi and in the apical region may break up into fine apical ramifications (Plate D, 8), the four and five-rooted forms offer a most complex network of canals, canaliculi, and apical ramifications, which prove that the upper third molar has the most differentiated root-canals (Plates XV a and XV b, 10-54, Plate G 1, 5-12, Plate G 2, 1-5).

The upper third molars hold the first place with reference to the number of apical ramifications as well as root-canals. Out of 16 examined upper third molars, Fischer found all except 1 branched; 3 had one root-canal, 4 had two canals, 7 had three canals, and 2 had four canals.

My results, which are based upon 95 molars, verify Fischer's results. Table 15 is a summary of my results according to ages.

Lower Third Molars

Normally the lower third molars have two roots; however, there may be three to five present, but usually there is a fusion of the roots into one single root (Zuckerkandl). A splitting of the root is less frequent than in the upper, but according to Port, they show the same manifoldness as the uppers do with reference to position, size, abnormal twists and bends. With reference to branchings, the lower third occupies the lowest rank, which also corresponds to the in-

Table 15. Upper Third Molars

Age	Number	Number of Root-Canals					Number of Apical Branchings					Percentage	Number of Marrow Canals					Percentage
		1	2	3	4	5	1	2	3	4	5		1	2	3	4	5	
20-30	20	4	12	4	....	....	2	10	....	....	....	60	....	....	....	....	....	....
30-40	50	3	15	20	10	2	22	15	2	2	....	84	8	3	....	....	....	22
40-50	25	..	3	15	4	3	8	7	3	5	....	91	5	3	....	....	....	35
	95	7	30	39	14	5	32	32	5	7	....	80	13	6	....	....	....	20
		6%	32%	41%	15%	5%												

and there. Contrary to the upper thirds, there are very few differentiations of the root-canals in the lower thirds. The anastomoses connecting canals, branchings, and network are almost entirely absent, which corresponds to Fischer's observations (Plate X, 1-27, Plate G 2, 7-11).

Table 16 is a summary of my observations on the lower third molars.

TABLE 16. LOWER THIRD MOLARS

Age	Number	Number of Root-Canals				Number of Apical Branchings				Percentage	Number of Marrow Canals				Percentage
		1	2	3	4	1	2	3	4		1	2	3	4	
20-30	14	3	11	....	....	.....	1	.....	.....	7	.....	.....	.....	.....	14
30-40	46	1	35	10	4	.....	5	.....	.....	11.5	.....	2	.....	.....	5
40-50	20	.....	10	10	....	.....	3	.....	.....	14	.....	1	.....	.....	5
	80	4	56	20	....	.....	9	.....	.....	10.2	.....	5	.....	.....	6
		5%	82%	13%											

CONCLUSION

1. The inner hollows of the roots of human teeth are usually in conformity with the outer form of the root but may show a more or less far-reaching differentiation according to the type of tooth by the appearance of (a) dentinal walls of division within the root-canals, (b) delicate apical ramifications, (c) marrow canals which pass to the peridental membrane from the main canal thru the dentin.

2. These formations of differentiation normally occur in teeth not externally marked, and are to be regarded as purely anatomical, relatively physiological products of development.

3. The form and number of root-canals are influenced greatly by the dentinal partitions within the pulpal cavity formed by means of a physiological addition of dentin. These occur especially in predisposed types of teeth, having lateral compressions and determine the extensive differentiations within the simple canal, which are characterized by the appearance of spaces, bridge-like systems, and especially the final division of the canal into two separate canals. This division of the root-canals appears especially in the lower incisors and cuspids, the mesio-buccal root of upper first and second molars, and in the bicuspids.

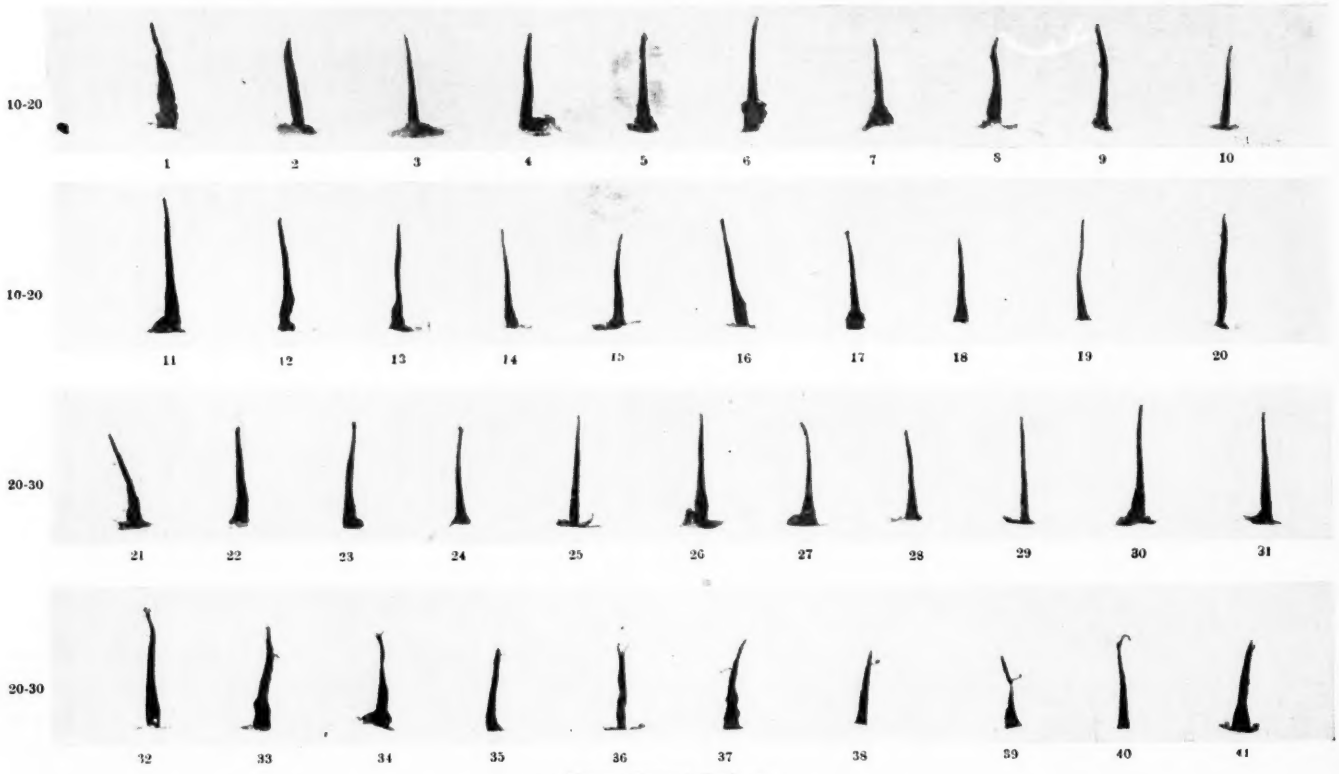
4. The finer apical ramifications appear regularly in various human teeth and in a different numerical relation for each type of tooth. They determine a netlike structure formed by numerous fine canaliculi at the root apices, especially in the upper third molars, in the mesio-buccal roots of the upper first and second molars, in the mesial roots of the lower first and second molars, and in the upper and lower bicuspids.

5. The marrow canals likewise occur in various types of human teeth and either represent connecting canals between the separate canals or as canals penetrating the dentin from the main canal to the peridental membrane singly or in numbers.

6. There is also an influence of age upon the form and number of the root-canals, since, in youth, before the closure of the apical foramen, the differentiations are absent generally, and after the closure of the apical foramen the division into two takes place accompanied by other differentiations. With the progress of age, there is a more or less regular increase in formation of dentin and a narrowing of the root-canal which may lead to a complete obliteration of the same.

Age

Plate Ia



Upper Central Incisors

1-20, Teeth from the ten-to-twenty-year period with wide root-canals of simple structure, the apical foramen still partly open.

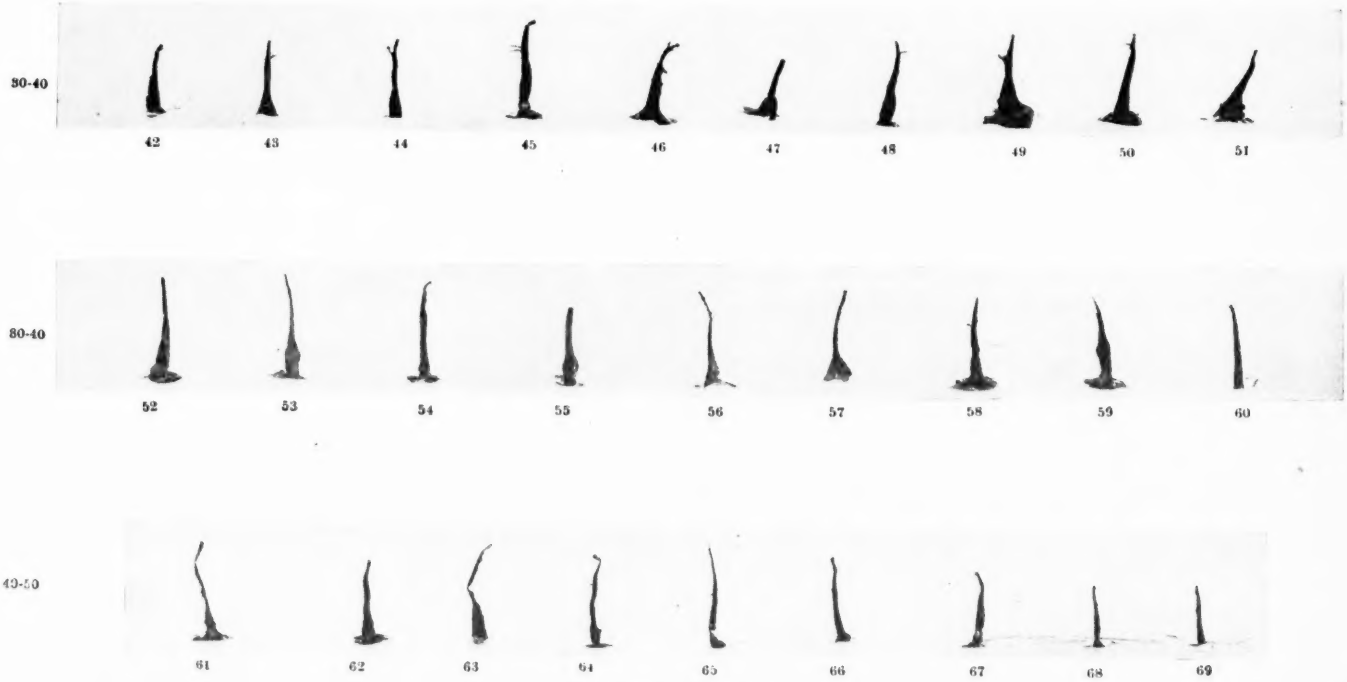
21-41, Teeth from the twenty-to-thirty-year period, canals narrow, the appearance of apical twigs and marrow canals from pulp to peridental membrane, the latter at varying heights.

Note.—Forms made of Woods metal, one of the eutectic group. Formula: bismuth 4, lead 2, tin 1, cadmium 1; fusing point, 60½°C.

21-41, Teeth from the twenty-to-thirty-year period, canals narrow, the appearance of apical twigs and marrow canals from pulp to peridental membrane, the latter at varying heights.

Note.—Forms made of Woods metal, one of the eutectic group. Formula: bismuth 4, lead 2, tin 1, cadmium 1; fusing point, 60½°C.

Plate I b



Upper Central Incisors

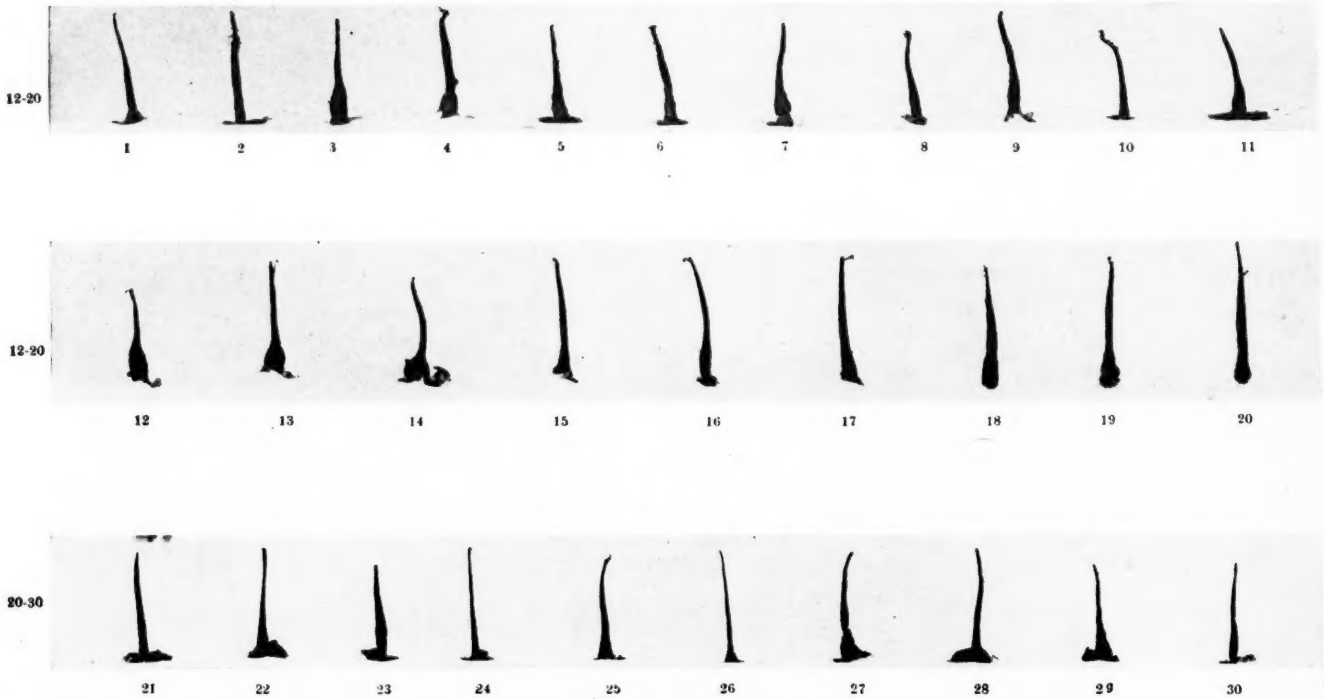
42-51, Showing root-canal of the thirty-to-forty-year period with various marrow canals which run from the canals to the peridental membrane; also apical branches.

52-60, Teeth of the same period with less voluminous canals and but one marrow canal.

61-69, Teeth of the forty-to-fifty-year period with reduced canal volume, fewer marrow canals, and no apical branches.

Age

Plate II a



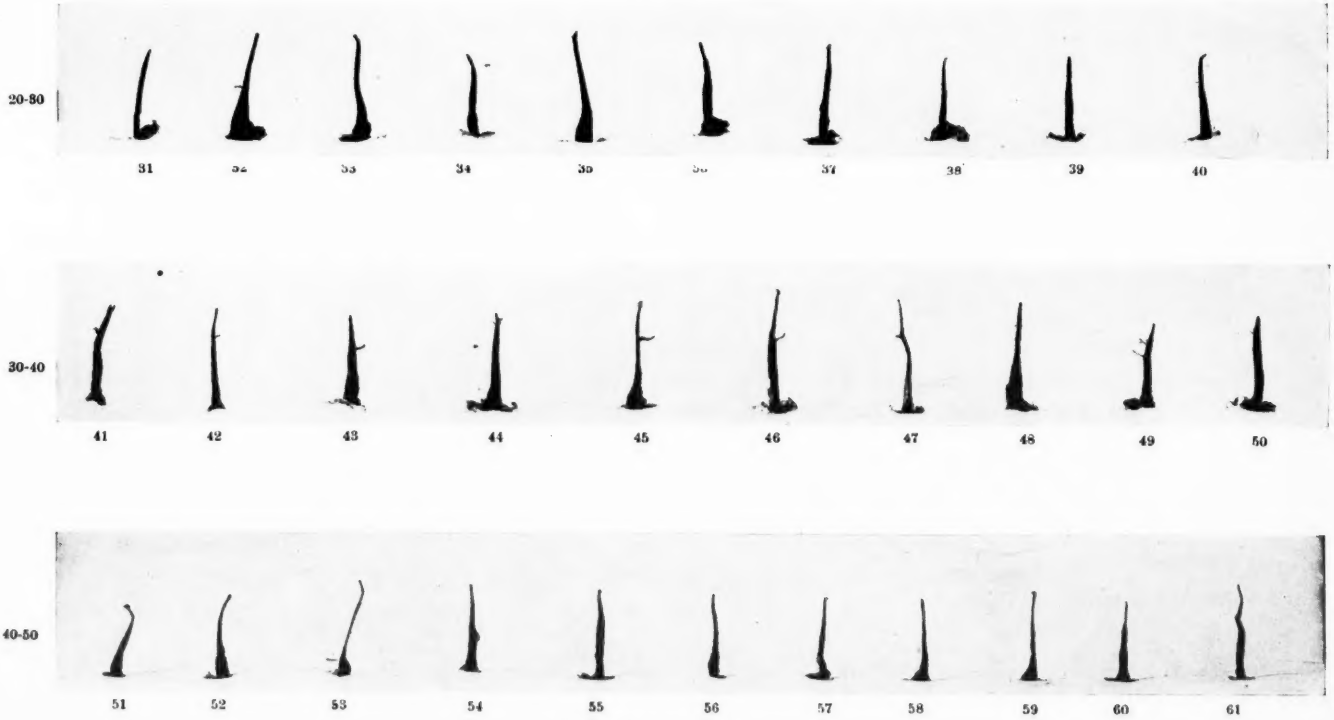
Upper Lateral Incisor

1-11, Root-canals of teeth from twelve-to-twenty-year group of simple but voluminous structure.
12-20, Teeth of the same period with apical branches and marrow canals.
21-30, Simple canals with reduced volume.

21-30, Simple canals with reduced volume.

Age

Plate II b

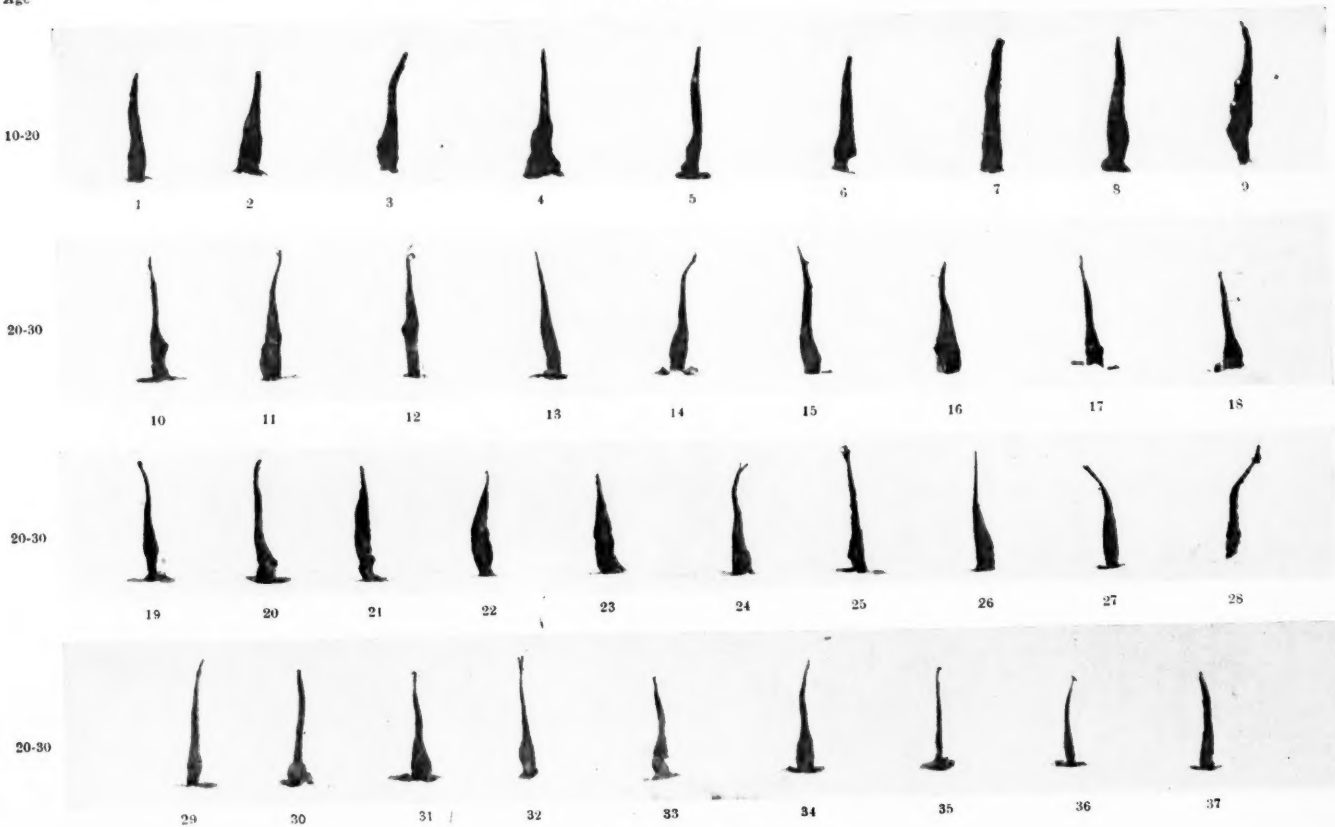


Upper Lateral Incisor

31-40, Teeth with structure similar to that of Nos. 21-30, with a single marrow canal.

41-50, Root-canals of teeth of thirty-to-forty-year group with numerous marrow canals exhibiting some apical branches.

51-61, Strong narrowing of simple canals derived from forty-to-fifty-year-old teeth.



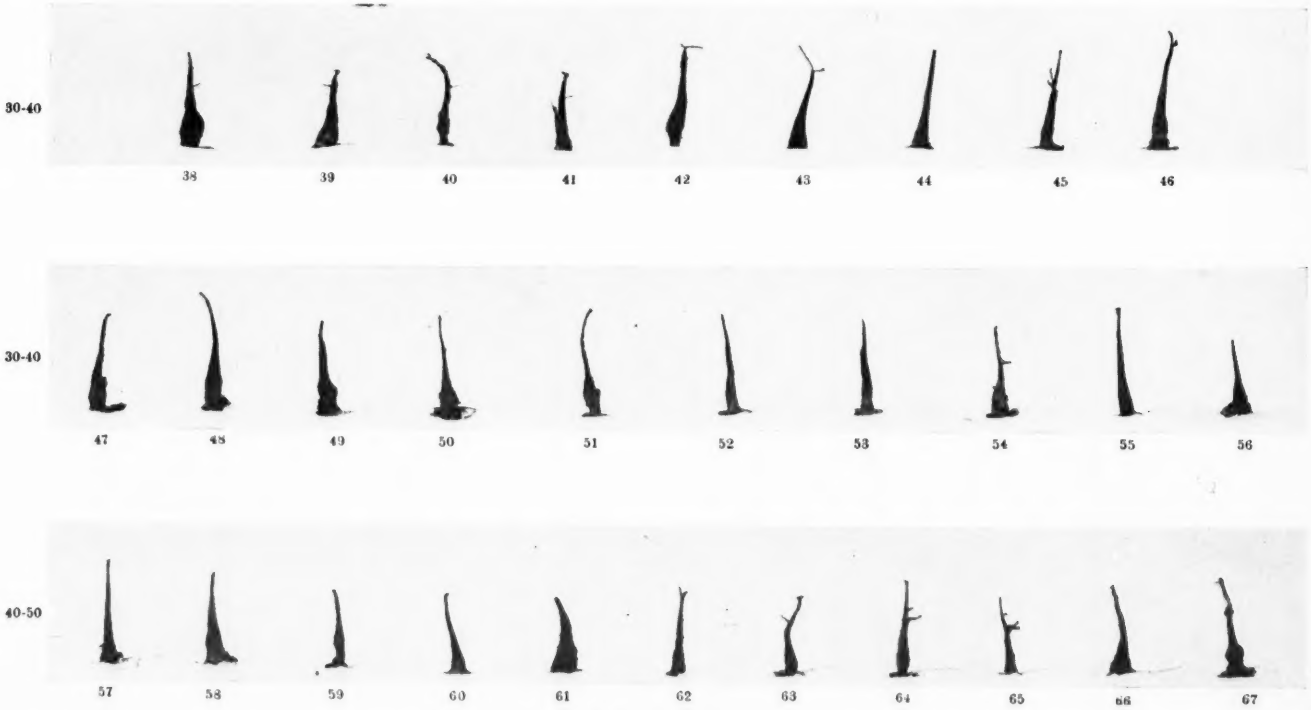
Upper Cuspids

1-9, Teeth from ten-to-twenty-year period with very voluminous root-canals and open apical foramen.
10-18, Teeth from twenty-to-thirty-year period with apical twigs and marrow canals.
19-37, Teeth from twenty-to-thirty-year period with narrow simple canals.

1-9, Teeth from ten-to-twenty-year period with very voluminous root-canals and open apical foramen.
10-18, Teeth from twenty-to-thirty-year period with apical twigs and marrow canals.
19-37, Teeth from twenty-to-thirty-year period with narrow simple canals.

Age

Plate III b

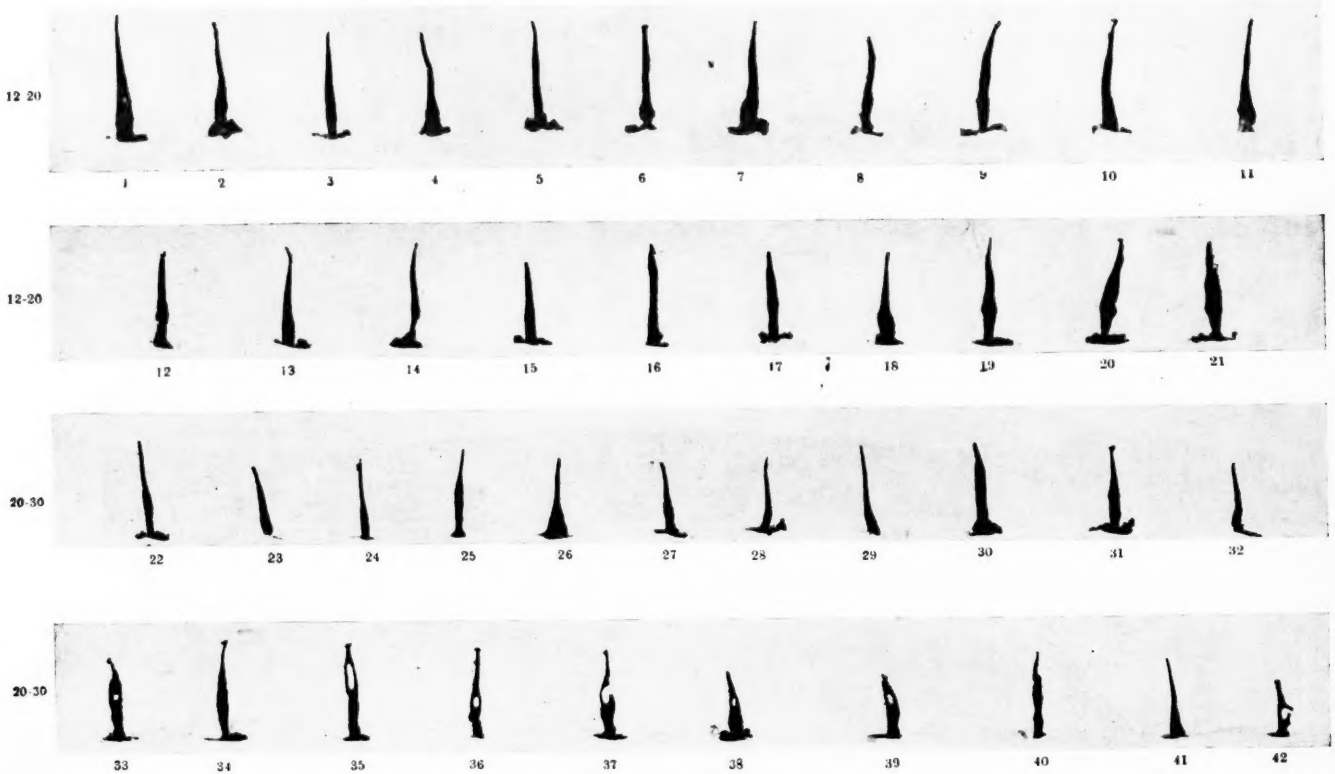


Upper Cuspids

38-56, Root-canals of teeth from thirty-to-forty-year period reduced in volume with many marrow canals and apical branches.
57-67, Root-canals of teeth from forty-to-fifty-year period showing greater reduction in size.
63-65, Showing beautiful marrow canals.

Age

Plate IV a



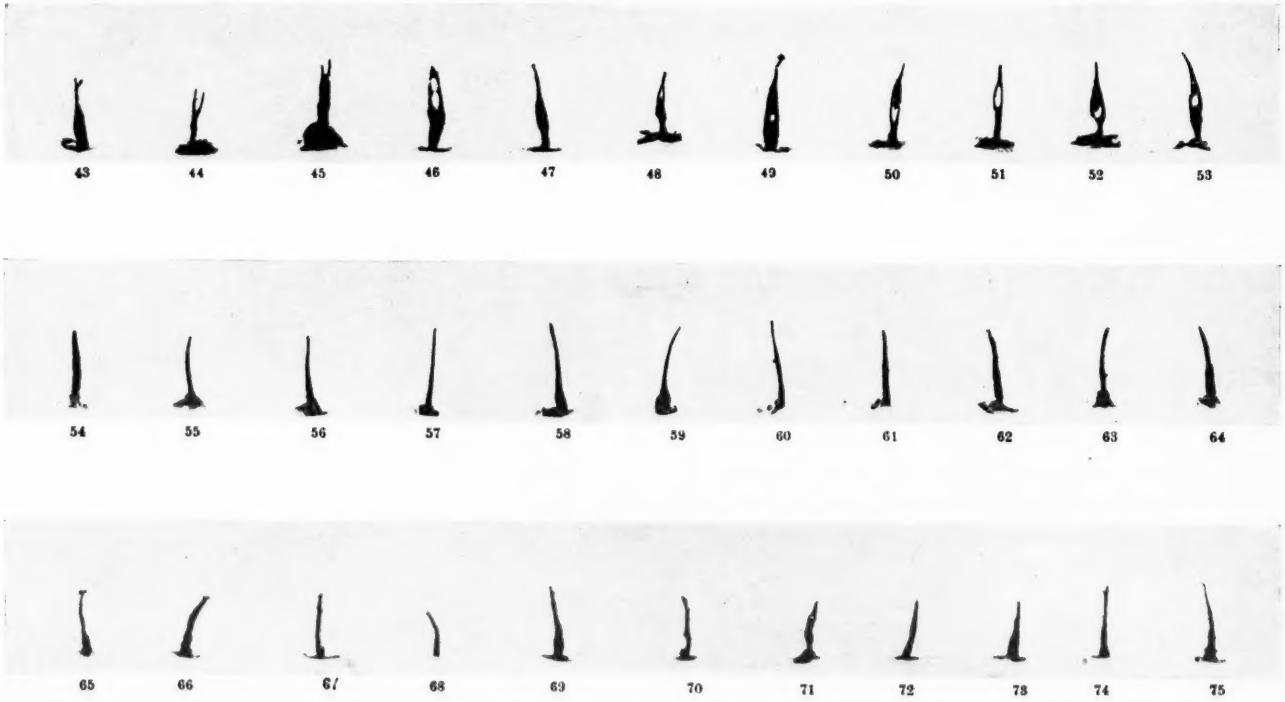
Lower Central and Lateral Incisors

1-21, Teeth from twelve-to-twenty-year period with wide root-canals and no apical branches.
22-32, Teeth from twenty-to-thirty-year period of simple structure and reduced canal volume.
33-42, Teeth from twenty-to-thirty-year period with part of the canals in varying conditions.

1-21, Teeth from twelve-to-twenty-year period with wide root-canals and no apical branches.
22-32, Teeth from twenty-to-thirty-year period of simple structure and reduced canal volume.
33-42, Teeth from twenty-to-thirty-year period with part of the canals in varying conditions.

Age

Plate IV b



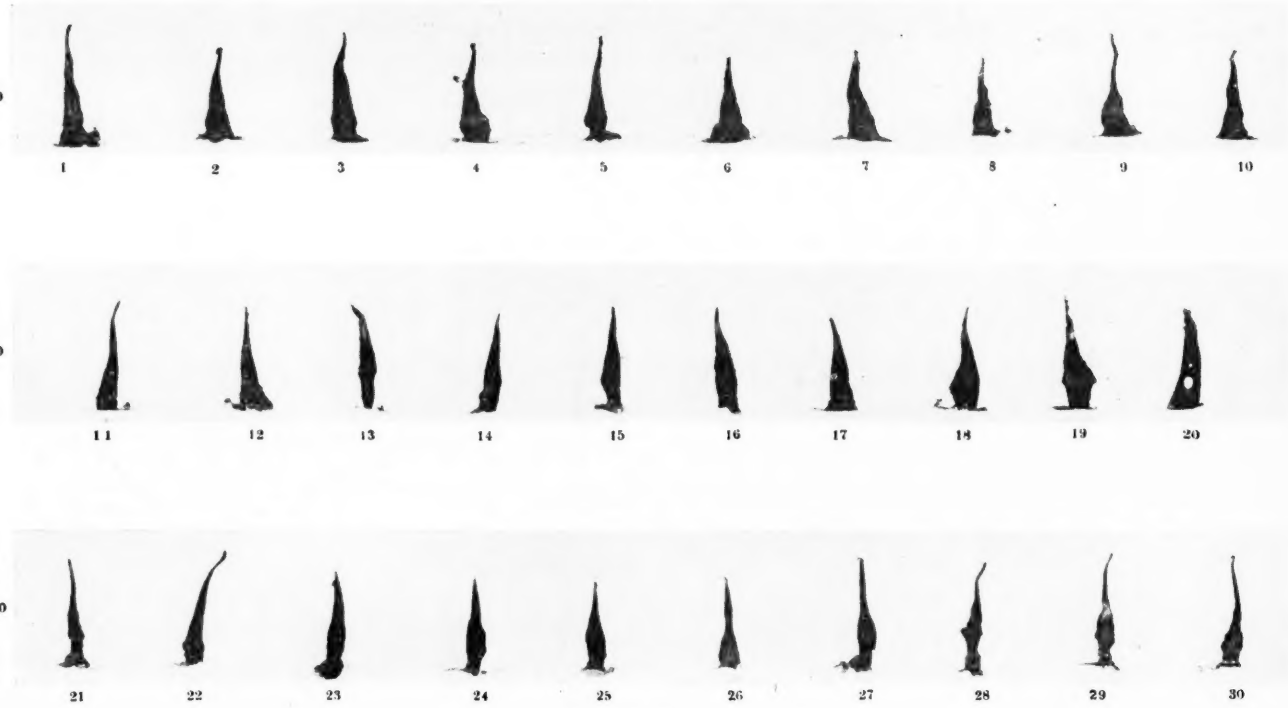
Lower Central and Lateral Incisors

43-64, Teeth from thirty-to-forty-year period, some of simple structure showing narrowed canals, others showing a wider form in the second part of the canal; Nos. 43-45 show a terminal fork.

65-75, Teeth from forty-to-fifty-year period showing reduction of the canal volume.

Age

Plate V a



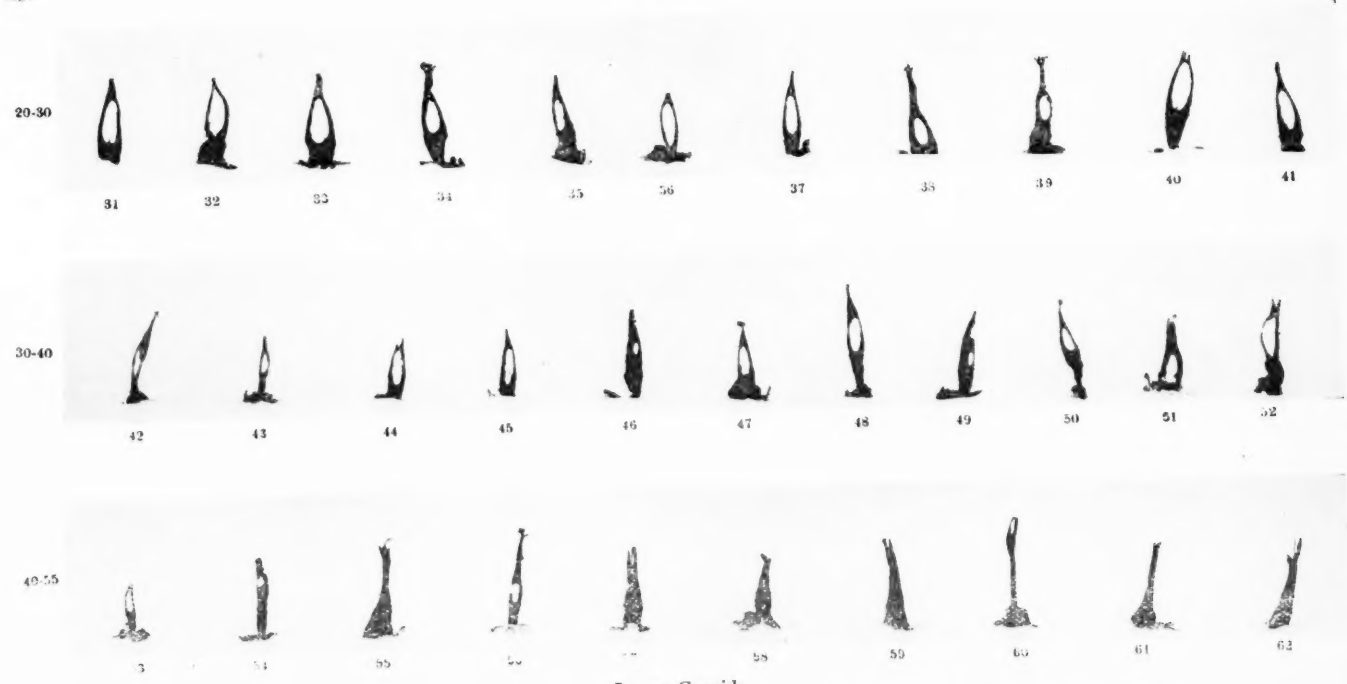
Lower Cuspids

1-20, Teeth of the twelve-to-twenty-year period with voluminously built root-canals, some with open foramina; No. 4 has a marrow canal; No. 20 shows the beginning of a division of the canal.

21-30, Teeth of the twenty-to-thirty-year period showing lessening volume in single-compartment canals

21-30, Teeth of the twenty-to-thirty-year period showing lessening volume in single-compartment canals

Plate V b

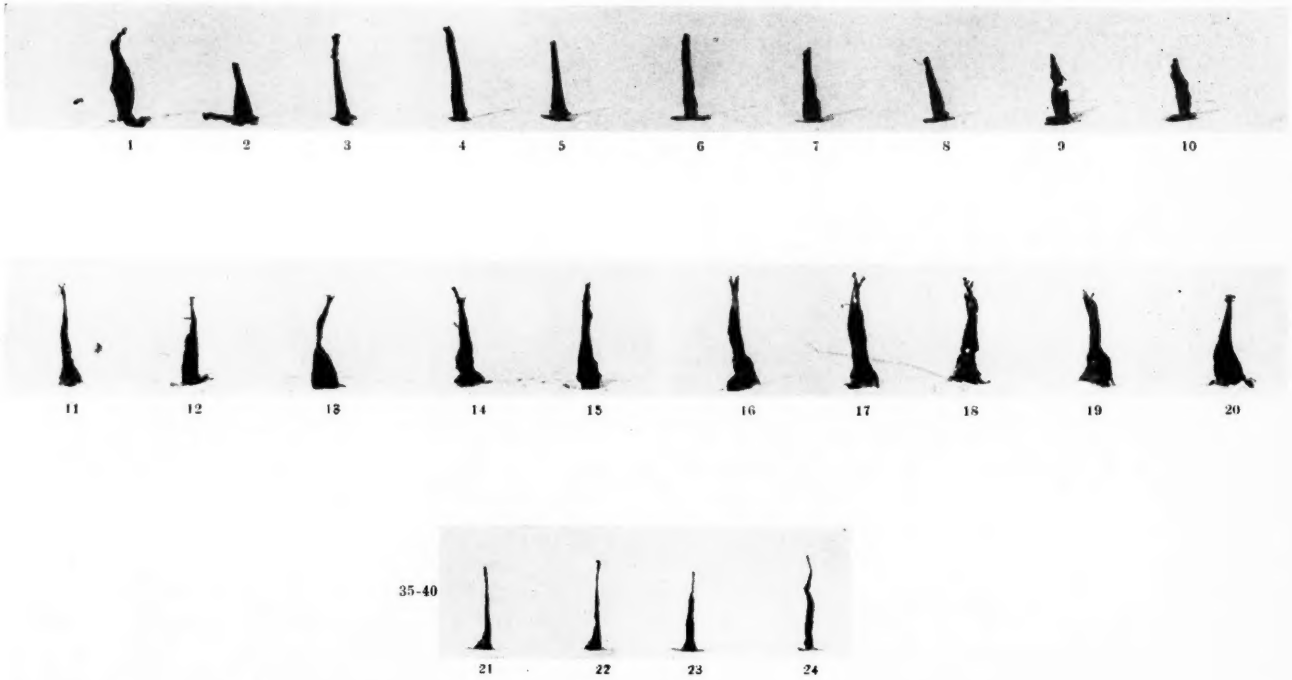


Lower Cuspids

31-41, Teeth of the twenty-to-thirty-year period showing the bipartition of the root-canals in various stages with apical twigs.
42-52, Teeth of the thirty-to-forty-year period with various forms of bipartition of the root-canals; Nos. 44, 45, and 47 present marrow canals.
53-62, Teeth of the forty-to-fifty-five-year period with simple or divided canals and no apical branches.

Age

Plate VI a



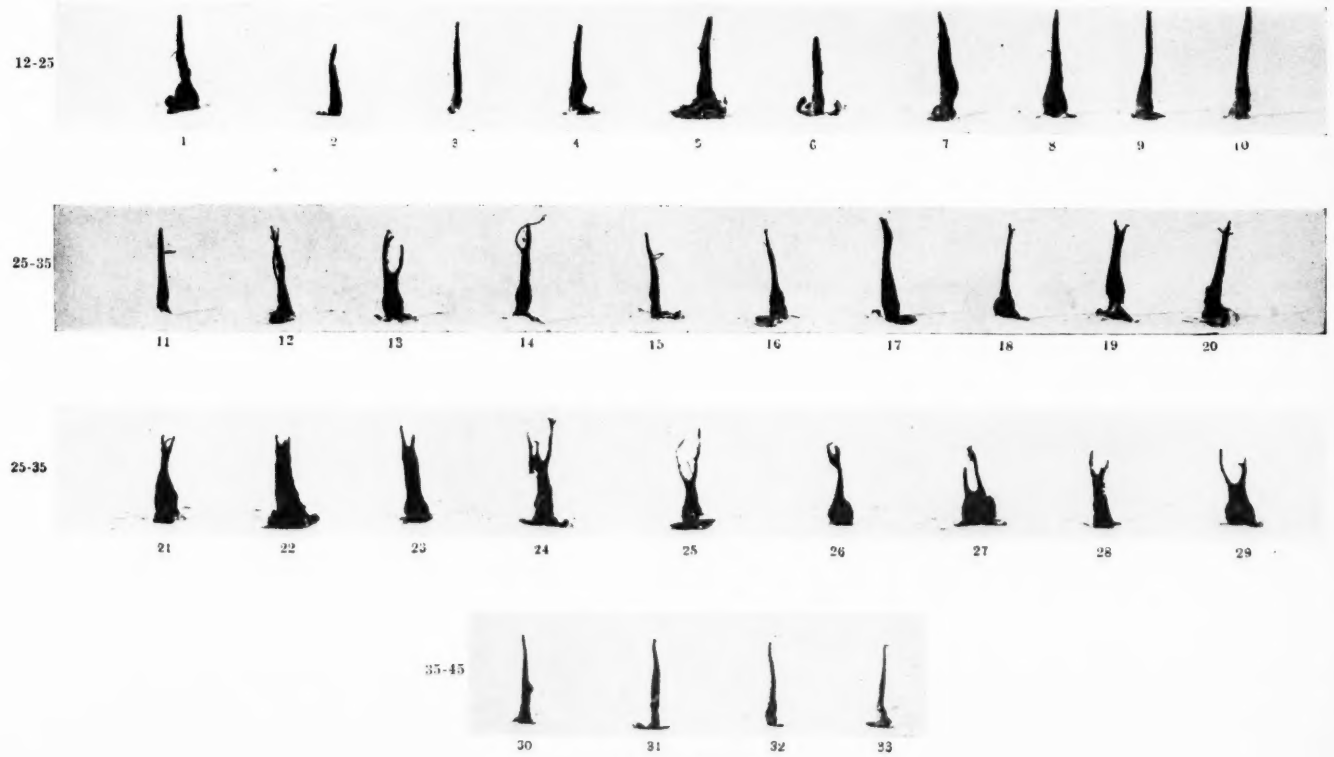
Lower First Bicuspids

1-10, Teeth of the twelve-to-twenty-five-year group with open foramina.
11-20, Teeth of the twenty-five-to-thirty-five-year group with numerous apical branches and marrow canals.
21-24, Teeth of the thirty-five-to-forty-year period with reduced canal volume and with one compartment.

21-24, Teeth of the thirty-five-to-forty-year period with reduced canal volume and with one compartment.

Age

Plate VI b



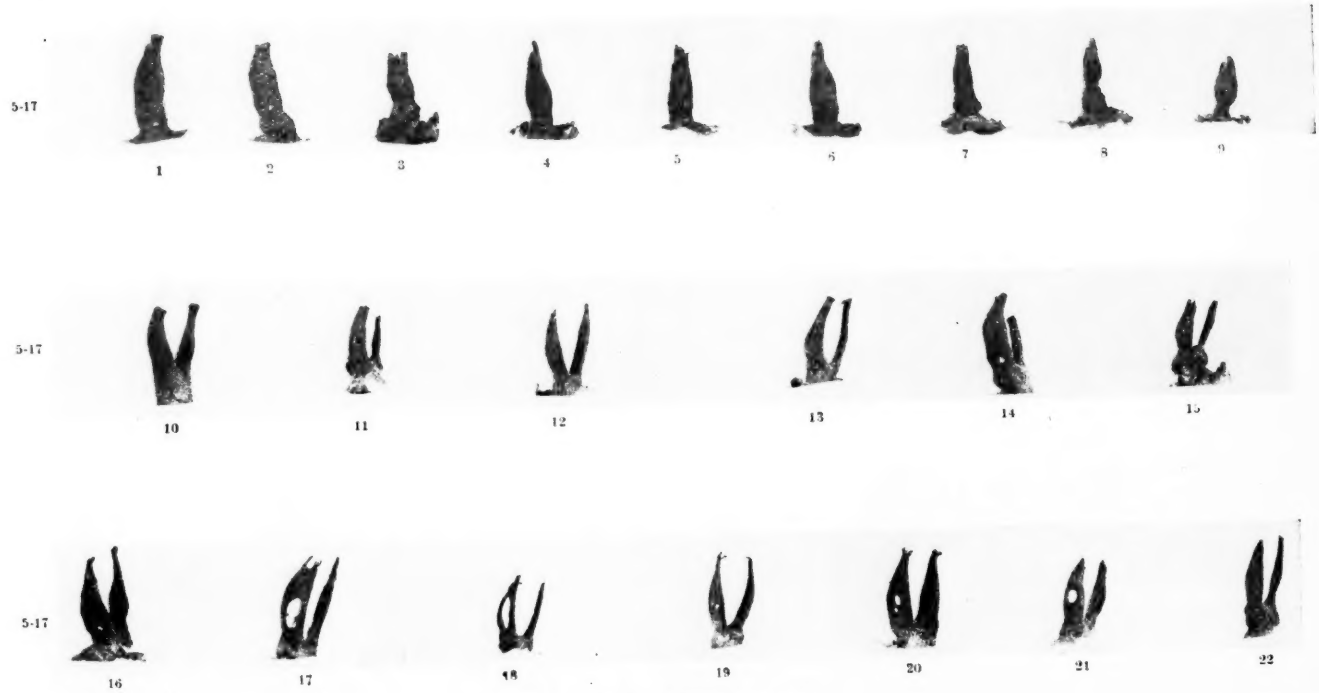
Lower Second Bicuspids

1-10, Teeth of the twelve-to-twenty-five-year group with voluminous root-canals and for the most part with open apical foramen.

11-29, Teeth of the twenty-five-to-thirty-five-year group, some with simple canals and some bipartite canals; Nos. 12, 13, 14, 27, 28, and 29 show two canals; Nos. 24 and 25 show intimation of a split into a third canal

Age

Plate VII a



Lower First and Second Molars

1-15, Teeth of the five-to-seventeen-year period with wide spacious root-canals and open apical foramina, showing only one canal in mesial and distal root.

16-27, Teeth of the five-to-seventeen-year period which show different stages of division in the mesial root; apical foramina closed with apical branchings of the canals.

16-27, Teeth of the five-to-seventeen-year period which show different stages of the branchings of the canals.

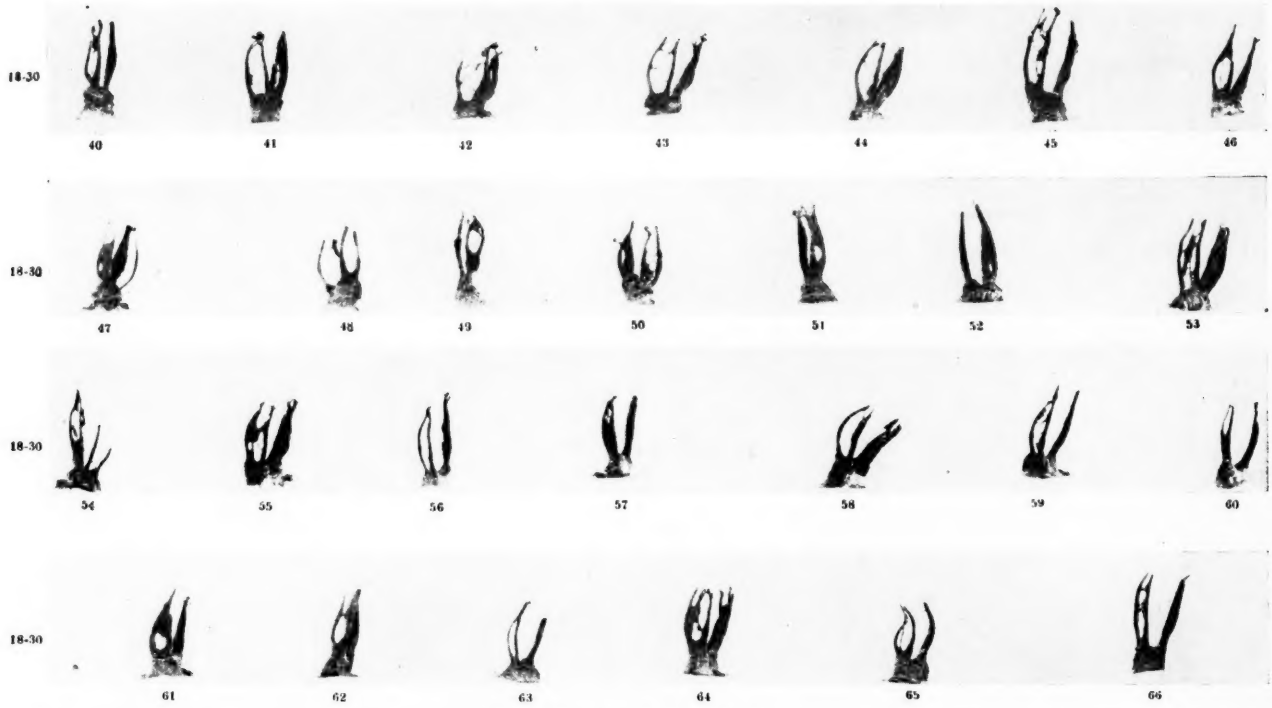
Plate VII b

Lower First and Second Molars

28-39, Teeth of the eighteen-to-thirty-year period, part with only two root-canals and part showing the partition of the mesial root-canals.

Age

Plate VIII a

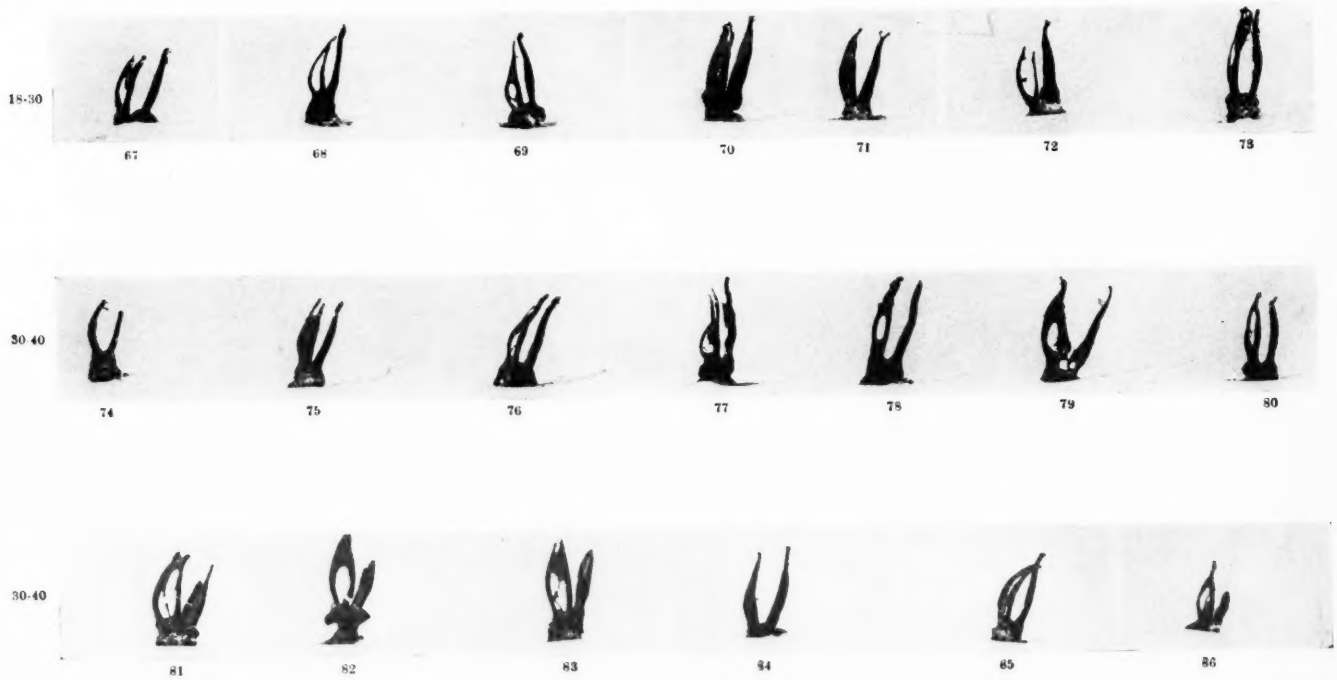


Lower First and Second Molars

40-66, Teeth of the eighteen-to-thirty-year period showing the complete division of the mesial canals as well as more seldom division of distal canals; in addition numerous apical ramifications and marrow canals are demonstrated.

Age

Plate VIII b



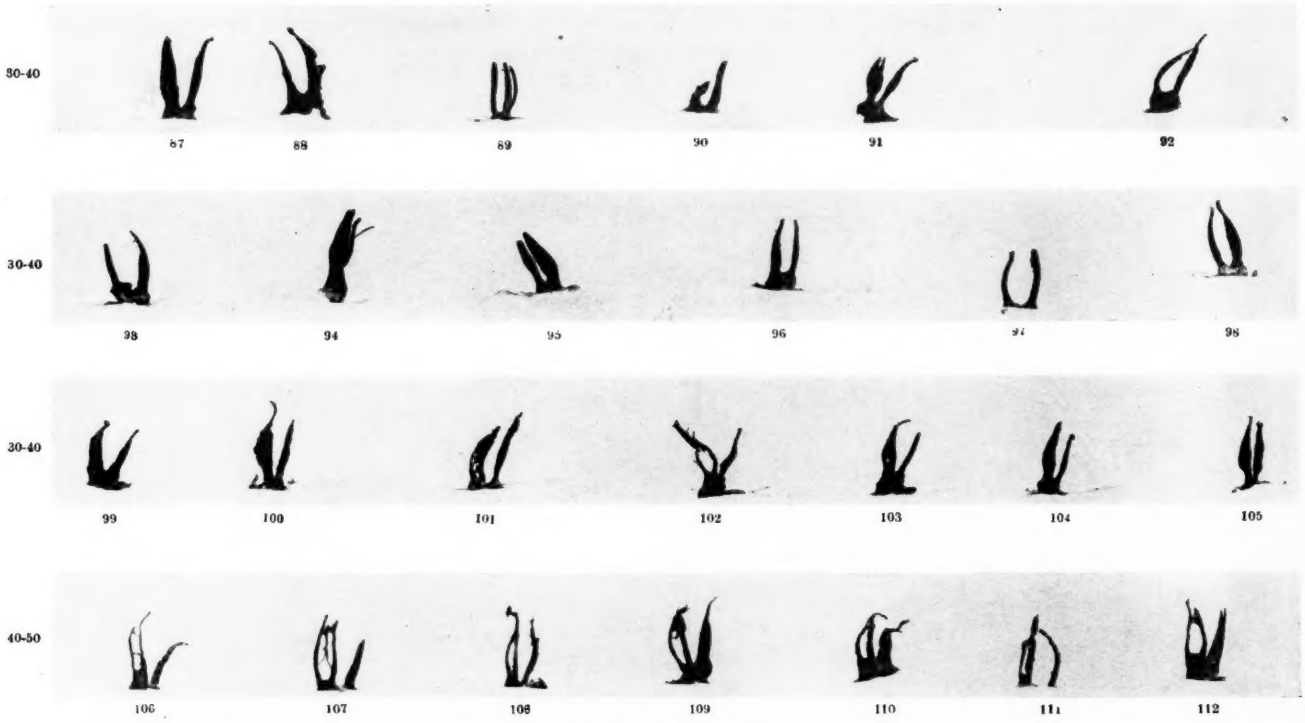
Lower First and Second Molars

67-73, Teeth of the eighteen-to-thirty-year period with two mesial canals, marrow canals, and apical branches.

74-86, Teeth of the thirty-to-forty-year period with two mesial canals in different conditions, with marrow canals and apical branches.

Age

Plate IX a



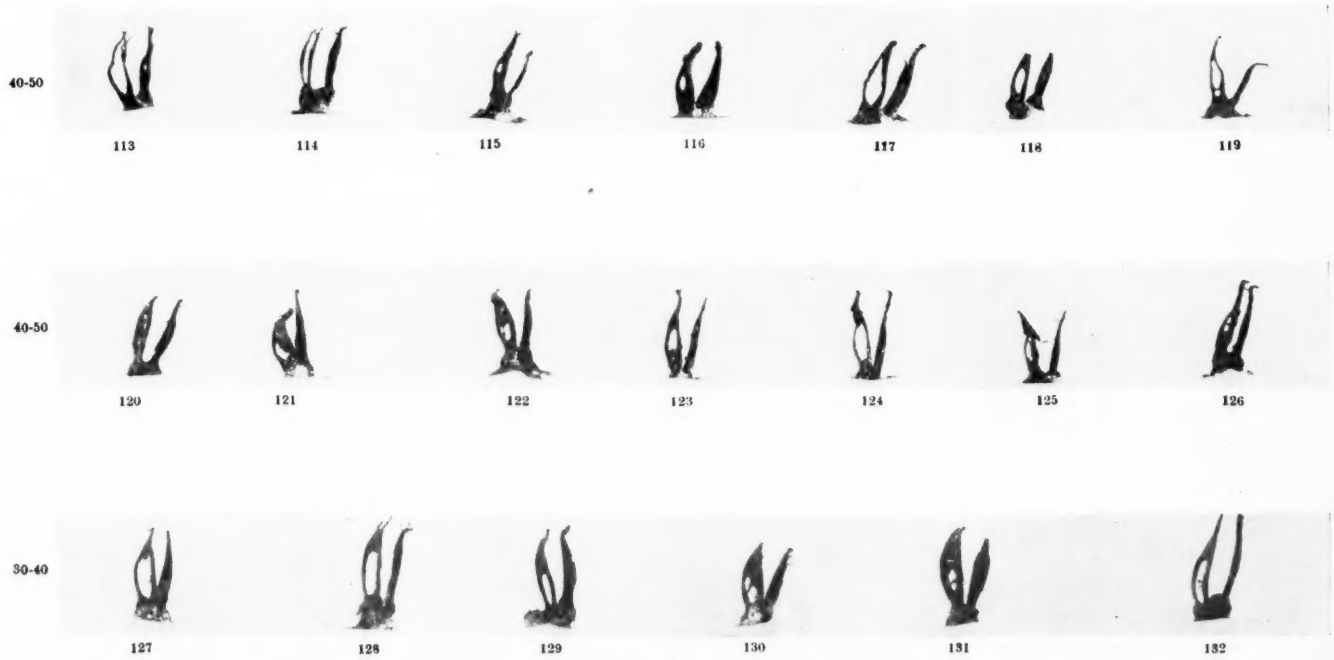
Lower First and Second Molars

87-105, Teeth of the thirty-to-forty-year period of simple structure with few marrow canals and apical branches.

106-112, Teeth of the forty-to fifty-year period with reduced canal volume, the mesial canal divided with numerous anastomoses and apical branches.

Age

Plate IX b

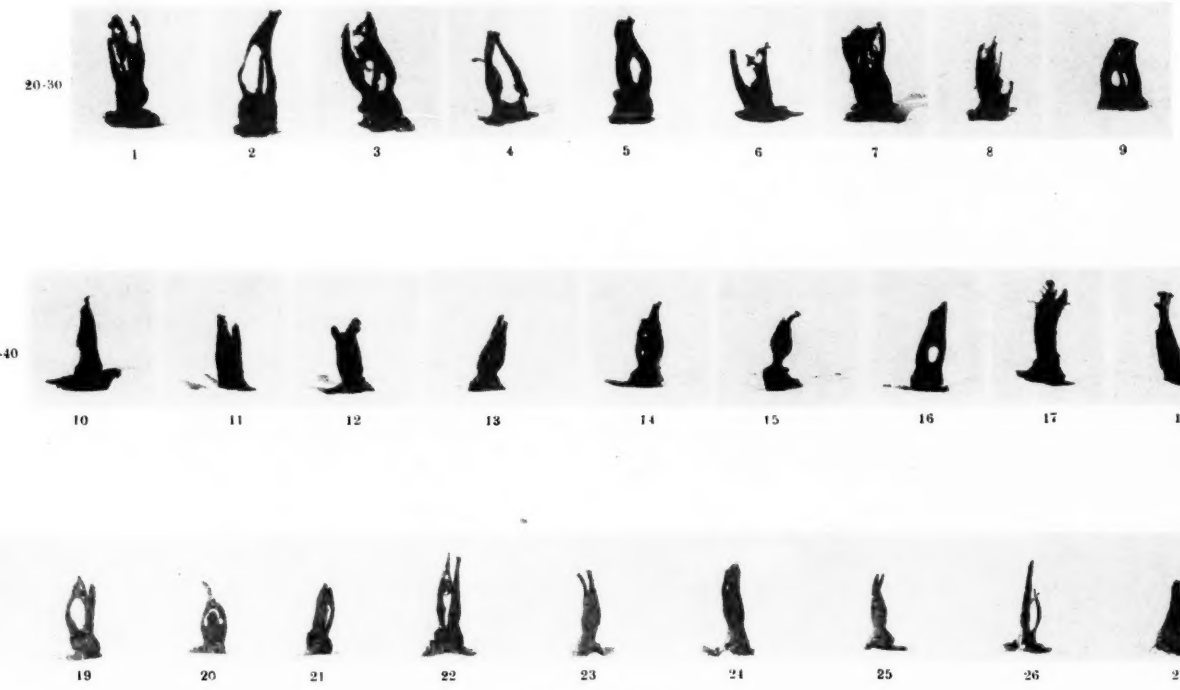


Lower First and Second Molars

113-126. Teeth of the forty-to-fifty-year period with reduced canal volume, the mesial root-canal divided with marrow canals and apical branches.
127-132. Teeth of the thirty-to-forty-year period with divided mesial canals, apical twigs and marrow canals.

Age

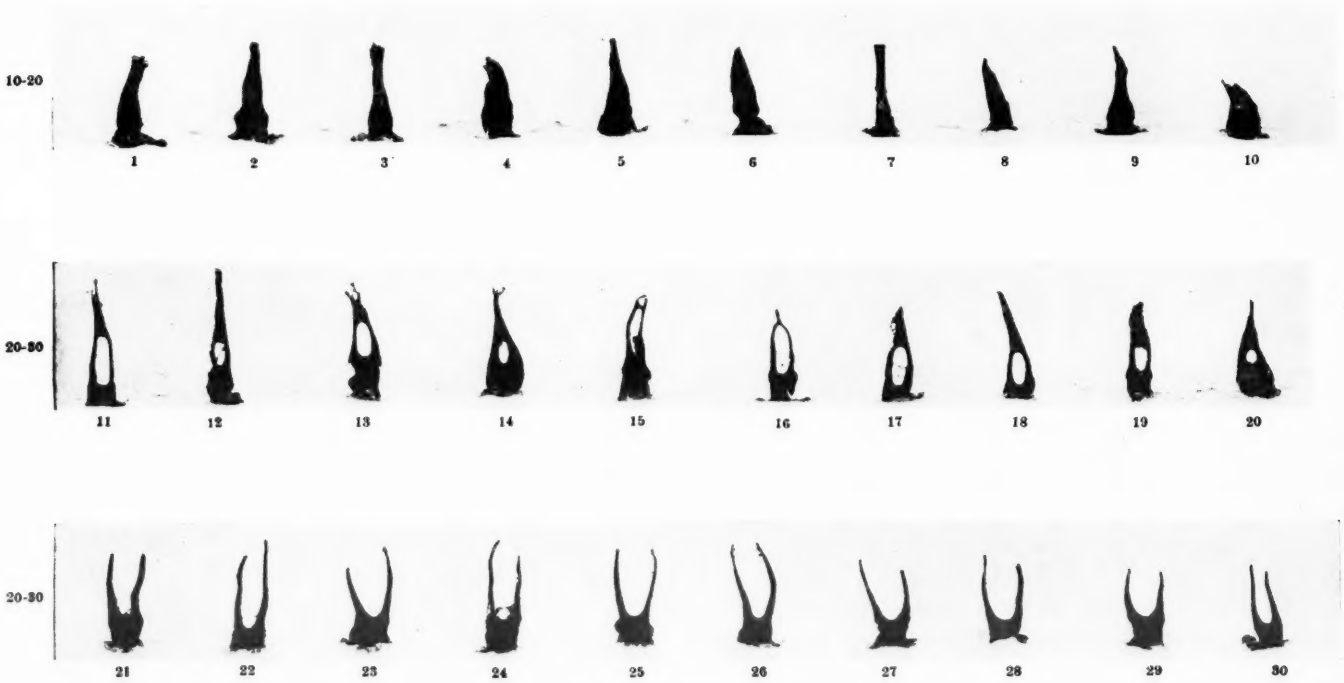
Plate X



Lower Third Molars

1-9, Teeth of the twenty-to-thirty-year period with canals confusedly united by anastomoses.
10-18, Teeth of the thirty-to-forty-year period with simple structure of canals and very few twigs at the apical foramina.
19-27, Teeth of the forty-to-fifty-year period, canals reduced in volume of simple structure.

Plate XI a



Upper First Bicuspids

1-10, Teeth of the ten-to-twenty-year period with very wide canals of single compartments and with open apical foramen.
11-20, Teeth of the twenty-to-thirty-year period showing divided canals in single-rooted bicuspids with marrow canals and apical branches.
21-30, Teeth of the twenty-to-thirty-year period showing two separate canals in double-rooted bicuspids.

Age

Plate XI b

30-40

31 32 33 34 35 36 37 38 39 40

30-40

41 42 43 44 45 46 47 48 49

40-50

50 51 52 53 54 55 56 57 58 59

Upper First Bicuspids

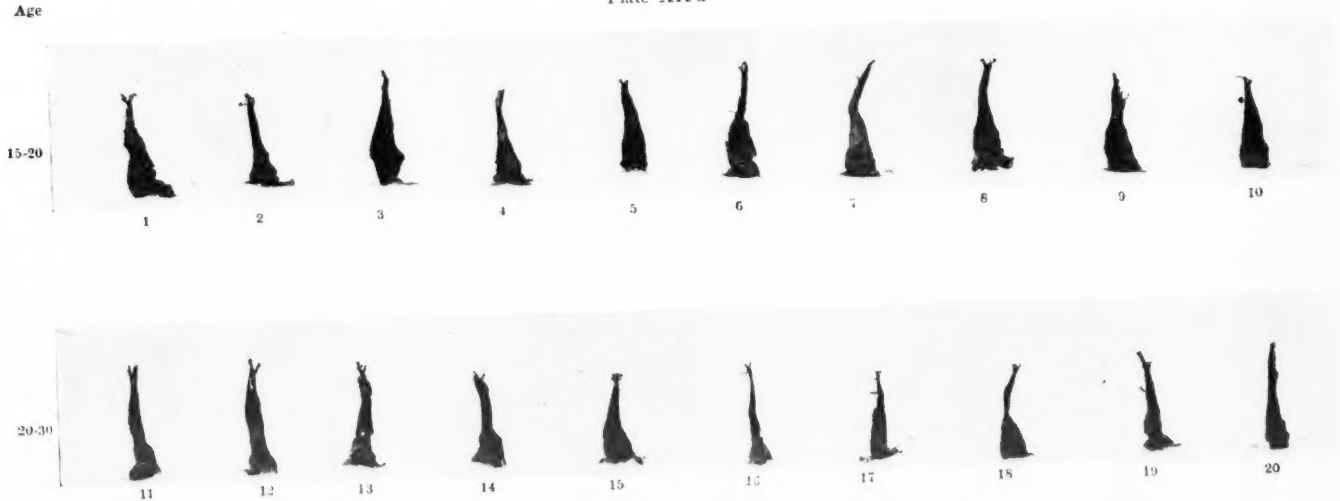
31-40, Teeth of the thirty-to-forty-year period showing various root-canal forms from a single compartment with an apical forking to a complex bridging between canals.

41-49, Teeth of the thirty-to-forty-year period with two separate canals and numerous marrow canals.

50-59, Teeth of the forty-to-fifty-year period with separate canals presenting numerous marrow canals and apical branches; Nos. 50, 51, 52, and 53 show a division of the buccal canals into two canals.

50-59, Teeth of the forty-to-fifty-year period with separate canals presenting numerous marrow canals and apical branches; Nos. 50, 51, 52, and 53 show a division of the buccal canals into two canals.

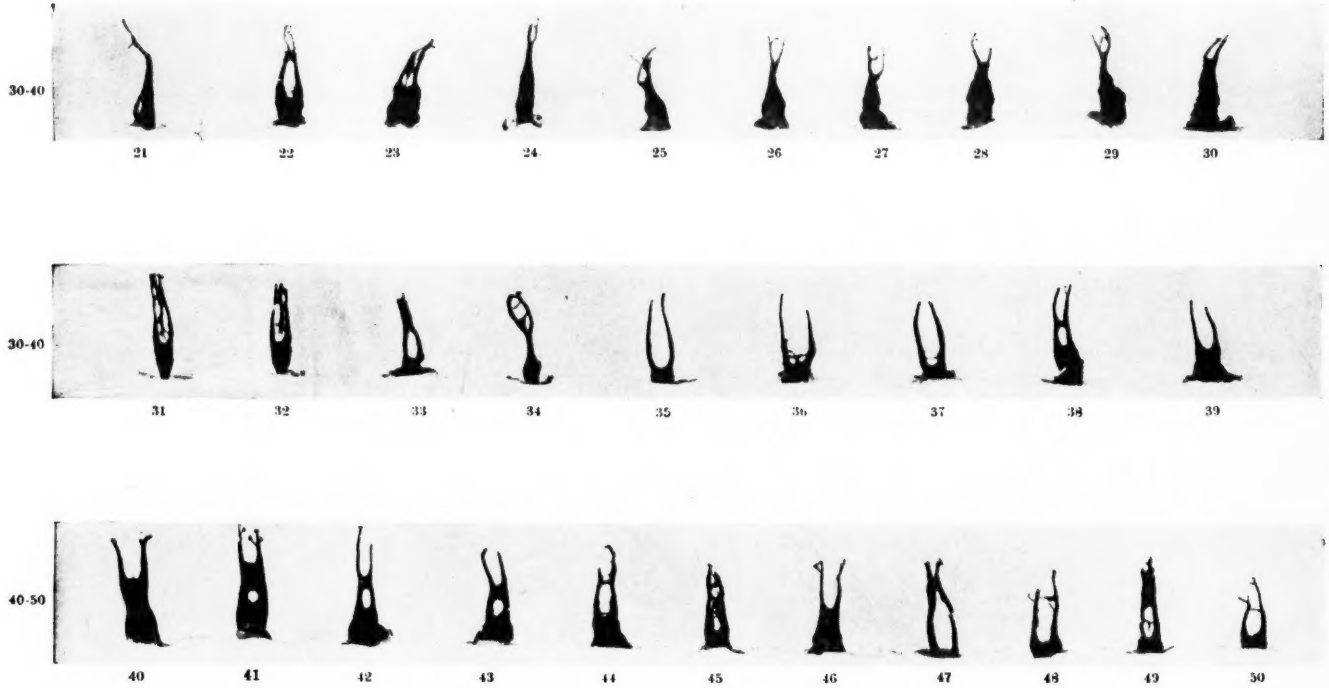
Plate XII a



Upper Second Bicuspids

1-10, Teeth of the fifteen-to-twenty-year period with closed apical foramina presenting apical twigs and marrow canals.
11-20, Teeth of the twenty-to-thirty-year period, whose canals have less volume, apical divisions, and marrow canals.

Plate XII b



Upper Second Bicuspids

21-30, Teeth of the thirty-to-forty-year period having a single-compartment canal ending in a fork which has fine apical divisions.
31-39, Teeth of the thirty-to-forty-year period with divided canals united by bridges in various ways.
40-50, Teeth of the forty-to-fifty-year period with variously formed canals.

Plate XIII a

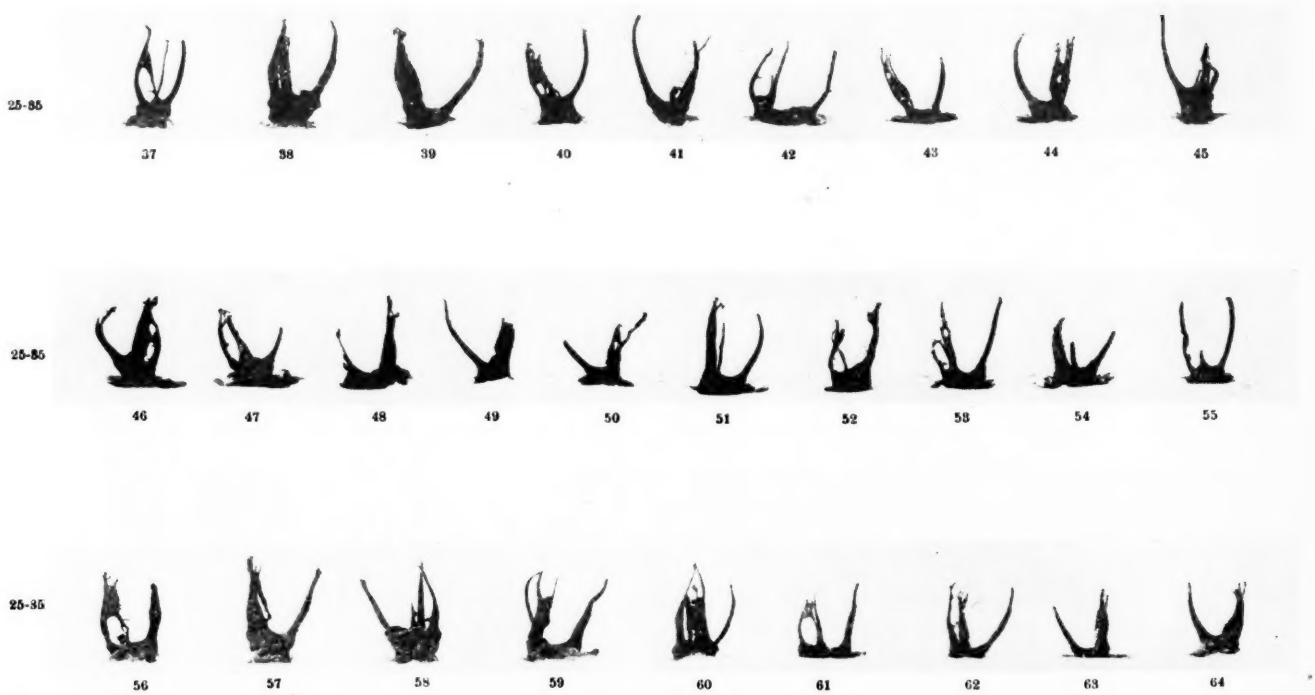
Upper First and Second Molars

1-17, Teeth of the fifteen-to-twenty-five-year period with wide root-canals and partially open apical foramina.

18-36, Teeth of the twenty-five-to-thirty-five-year period, showing apical branches and narrow canals, the mesio-buccal root-canal being in various stages of division from a simple canal to fully divided canals with numerous anastomoses.

Age

Plate XIII b



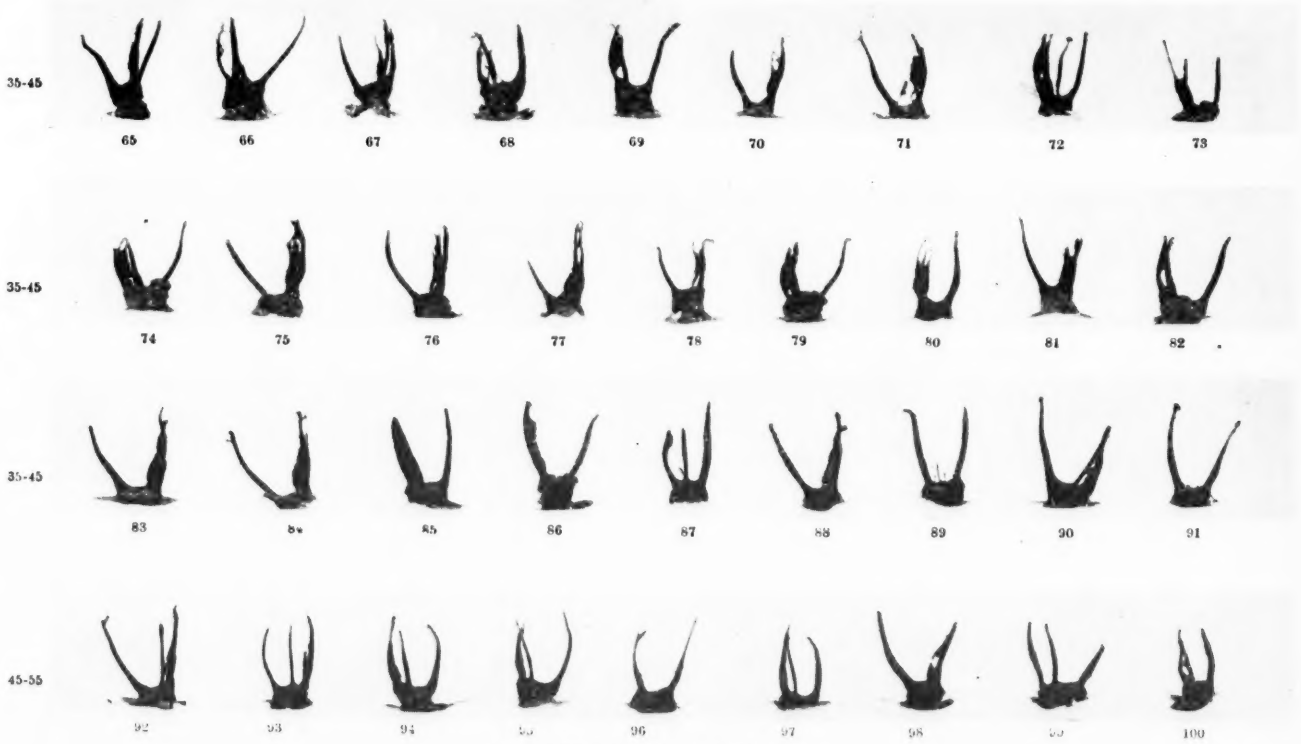
Upper First and Second Molars

37-64, Teeth of the twenty-five-to-thirty-five-year period showing apical branchings and marrow canals with various stages of division of the mesio-buccal canals from a simple structure to a complicated bridging system; also a complete division of the canal.

mesio-buccal canals from a simple structure to a complicated bridging system, also a complete division of the canal.

Age

Plate XIV a



Upper First and Second Molars

65-91, Teeth of the thirty-five-to-forty-five-year period with reduced canal volume and numerous apical twigs splitting from the mesio-buccal canal.

92-100, Teeth of the forty-five-to-fifty-five-year period with narrowed canals, the canals being of simple form with few apical twigs.

Age

Plate XIV b

35-45

101 102 103 104 105 106 107 108 109

45-55

110 111 112 113 114 115 116 117 118 119

45-55

120 121 122 123 124 125 126 127 128 129 130

Upper First and Second Molars

110-130. Teeth of the forty-five-to-fifty-five-year period with reduced canal volume and only a few apical divisions.

Age

Plate XV a

Upper Third Molars

1-9, Upper third molar with one canal of simple form forking at the end, with apical twigs; age, twenty to thirty years.

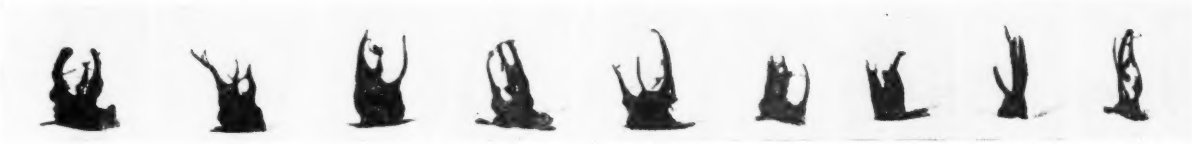
10-18, Teeth of the twenty-to-thirty-year period with two canals which divide in the apical region with cross-bridging and side canals.

19-27, Teeth with three canals with numerous apical twigs and marrow canals beside numerous complicated cross-bridgings; age, thirty to forty years.

Age

Table XV b

30-40



25 29 30 31 32 33 34 35 36

30-40

37 38 39 40 41 42 43 44 45

40-50

46 47 48 49 50 51 52 53 54

Upper Third Molars

28-45, Teeth of the thirty-to-forty-year period with two or three canals, fine apical canals, and marrow canals; Nos. 28, 31, 33 and 34 have youthful form of the twelve-year period.

46-54, Teeth of the forty-to-fifty-year period with four or five canals of complicated structure, apical twigs, marrow canals, and cross-bridging.

IMPAIRED FUNCTION AS A RESULT OF CLOSED BITE

By GEORGE S. MONSON, D.M.D., St. Paul, Minnesota

(Read before the Illinois State Dental Society, Peoria, Illinois, May 10-12, 1921)

THE essential point to be considered in determining facial dimensions in the reconstruction of human occlusion, whether in natural or artificial dentures, is the position of the condyle in relation to the external auditory meatus. In this paper we shall confine our discussion to this problem as it appears in full denture construction. The same conditions to which we shall call attention, do exist in natural dentition, the relationship of mandible to maxilla having been changed thru one or more of various reasons, causing a loss in facial dimensions.

As an ideal or normal from which to start, let us take a patient at an age between twenty-five and thirty, with all natural teeth in position, with good occlusion and as yet showing little wear upon the cusps. This patient (Fig. 1 A) still has her normal facial dimensions, or the normal measurement between the base of the nose and the tip of the chin with the teeth in central occlusion (Fig. 2). This normal facial dimension is the first evidence of an anatomical relationship which permits proper functions of the mandible, the tongue and all tributary organs. With this anatomical picture in mind, let us liken the mandible and its attached neck muscles to a sack holder. By careful study of Figures 3, 4, 5, it is apparent how the mandible with attached neck structures is similar to a device for holding open the mouth of a sack. Much of the functional activities of the structures of the neck depend upon their being suspended in nearly the normal position, as nature planned. The tongue with its great function of swallowing must have area to work in as well as proper relationship to adjacent tissues and parts, which depend for health upon drainage resulting from the act of swallowing. This is particularly noticeable in the mucous membrane about the teeth and the drainage of the Eustachian tubes.

Clinically we find patients with loss of facial dimension because the mandible is too close to the maxilla, due to imporperly constructed dentures, wear on natural teeth, or any other reason. The shortening of this osseous framework, as just stated, naturally shortens the distance between the origin and insertion of the masticating muscles, causing a decrease in the muscle pull and consequently the throwing out of balance of muscle activity. This loss of balance in muscle activity and closing of the bite is the prime factor in producing the backward movement of the condyle (Fig. 6), which then encroaches upon the external auditory meatus, and often causes a resultant defect in hearing in a degree proportionate to the amount of encroachment.

youthful form of the twelve-year period.
46-54, Teeth of the forty-to-fifty-year period with four or five canals of complicated structure, apical twigs, narrow canals, and cross-bridging.

We find some cases where the canal is entirely closed. In cases of condyle en-

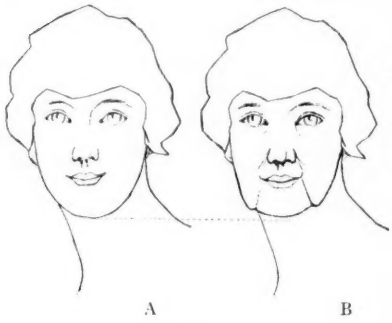


Fig. 1

croachment in varying degree, whether impairment of hearing is actually pres-

Fig. 2

ent or not, we find symptoms, such as sleeplessness at night, lack of concentration by day, and noises in the ears, which indicate a pressure upon certain nerves due to the changed anatomical relationship of the ossoeus structures. This diagnosis has been confirmed in a sufficiently large number of cases by correcting the facial dimensions, or by "opening the bite."

Further clinical evidence of the mandible being too close to the maxilla is

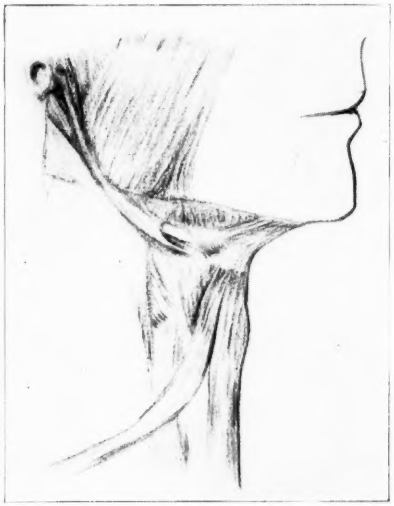


Fig. 3

the pronounced increase in the lines and ridges upon the face (Fig. 7). The ala of the nose is raised and the point of the nose is lowered by a crowding or pushing up of the tissues of the face; the base of the nose and the mouth are broadened and the angle formed by the base of the nose and upper lip increases as well as the angle between the lower lip and chin (Fig. 8). The apparent dropping of certain facial tissues, such as that of the cheek in forming the so-called chops, is in fact the result of the closing up of the mandible, leaving the cheek

tissue pendant. The facial tissue in the median line is pushed up and the cheek tissue hangs pendant, thus producing three distinct diagonal ridges, one from the bridge of the nose, blending into the cheek, one just below the ala of the nose continuous with the upper lip and cheek, and one from the angle of the

Fig. 4

mouth continuous with the lower lip (Fig. 1 B).

As a further result of the mandible being too close to the maxilla we have the tissues of the face pushing up, causing an actual shortening of the uper lip. It must be apparent, then, that denture construction based on a lip line is incorrect. This can be demonstrated by restoring the osseous framework as nearly as posible to its original or normal anatomical relationship; the upper lip will become longer in a short time. In other words, the upper lip accommodates itself to the osseous framework, no matter what it may be within its original limits. Therefore, it becomes necessary to set up teeth of the same length as the original, plus the amount of absorption of the ridge, *regardless* of the lip line. The orbicularis oris muscle soon adjusts itself to this return of the area upon which to drape, and what appeared at

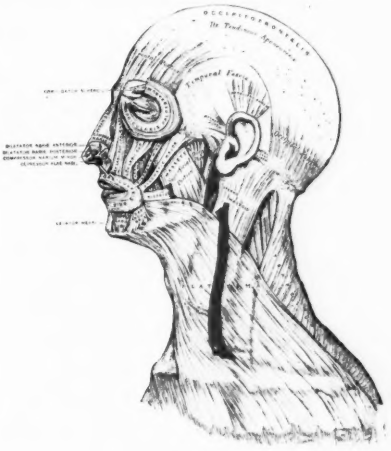


Fig. 5

first as a short lip with too much tooth showing becomes a longer lip, and the mouth assumes a more natural shape with the right amount of tooth showing.

As to the elastic movable tissues *in the oral cavity*, or the mucous membrane and its subtissues, we find in mouths of normal anatomical relationship, at an age where all natural teeth are present and where there has not been enough cusp wear to destroy normal facial dimension, that this tissue is smooth, without folds or creases. This tissue contains enough elasticity and adjustment to allow movement of the mandible. Loss of facial dimension from whatever reason, prin-

cipally improperly constructed dentures, produces loss of area, which gives a buckling and folding of the oral tissues, especially noticeable in the floor of the

Fig. 6

mouth. This condition causes trouble in seating lower dentures when this short dimension is maintained, but when properly corrected by re-establishing the dimensions before natural teeth were re-

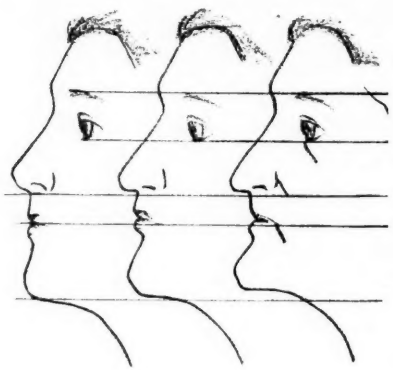


Fig. 7

moved these excessive folds of tissue disappear, due to greater area for the mucous membrane and its subtissue to cover. This re-establishment of dimension likewise straightens out the integument of the face and the muscles of expression beneath, thus diminishing the folds and chops previously mentioned.

This same condition, caused by a shortening of the distance between the mandible and maxilla, gives lessened area for the tongue, which in being thus forced back assumes a position that impairs its own function and crowds upon all adjacent tissues, lessening *their* function. Evidence so far indicates that this crowding of the tissues and impairment of the act of swallowing, which reduces the area of the air passages and causes a lack of drainage of all parts affected by the tongue, especially the Eustachian

Fig. 8

tubes, causes diseases of the ear, nose and throat.

Function of Swallowing

In our anatomically ideal subject we have the act of swallowing functioning to drain all parts of the oral cavity and Eustachian tubes. This is accomplished by a negative pressure, the tongue in contact with the gums on the lingual, and the cheeks and lips in contact with the gums on the buccal and labial. Thus we see that we must have anatomical correlation of parts to produce co-ordination in the act of swallowing and further that all sub-functions are dependent upon the function of swallowing or deglutition. In infancy this act of deglutition in conjunction with the act of sucking is a

potent factor in the development of the osseous structure, both of the jaws and base of the cranium, as well as the muscles of mastication and neck muscles. In adults this act of sucking is retained in that we find the lips and cheeks working in such a manner as to squeeze or force the contents of the vestibule or

Fig. 9

buccal and labial cavities thru the spaces around the teeth into the mouth cavity proper to be taken up by the tongue in the act of swallowing. Thus in swallowing, this modified act of sucking is a factor in maintaining muscular equilibrium due to the fact that the lip and cheek muscles are then exercising under normal conditions, providing all parts are in anatomically correct relationship. It is only after something has disturbed dimensions or occlusion that these functional acts are not correctly performed, with consequent loss of muscular balance. It must be apparent, then, that functional activities depend upon maintaining normal anatomical osseous relationship between mandible and maxilla, thereby maintaining the normal distance between the origin and insertion of the muscles involved. If for any reason the mandible assumes a position too close to the maxilla, lessening the distance between origin and insertion of the muscles involved, these same muscles lose their tone, their power of contraction is lowered and the muscular contraction is lost in proportion as the function of swallowing is impaired, because the harder the pull of the muscles with the teeth in central occlusion the more thoro is the function of swallowing performed.

It can readily be seen that in denture construction the so-called "taking the bite" or, as we choose to term it, securing normal facial dimension in central occlusion is more than the artist's or mechanic's viewpoint, for it must include a knowledge of anatomical relations and physiological function.

How to Diagnose and Correct

When a case presents for denture construction we must have a means of diagnosing anatomical conditions and relationships. This we do by looking for the evidences, especially for condyle encroachment upon the external auditory meatus. To do this we wish to determine if the dentures in use in the patient's mouth are of a length sufficient to maintain normal anatomical relation of the condyles to their osseous parts, because we find that dentures which are too short *do* permit the muscles to carry the condyles posteriorly. In other words, we have a muscular unbalance which produces a deformity. This shortens the distance between the origin and insertion of the muscles of mastication and, if

of long enough duration, produces loss of function in these muscles. The difficulty in restoring length and dimension is proportionate to the amount of atrophy developed. Diminished function produces atrophy.

A simple method of determining the condyle position is to stand in front of the patient and place the little fingers in the ear canal, the *thumbs* on the forehead; to steady the pressure put the little fingers toward the head of the condyles (Fig. 9). Instruct the patient to open and close the mouth slowly. Note that the condyles take a definite backward thrust when the mandible passes the point of normal occlusion. When there has been excessive use of one side in mastication there will be a more definite backward thrust of the condyle on that side. To find the normal occlusal rest, add enough pink base plate wax to the occlusion of the dentures to the point, where in the act of closing, the condyles can just be felt against the fingers. This represents the dimension to which the new dentures must be built to relieve condyle encroachment on the auditory meatus, and restores the normal distance between the origin and insertion of all muscles involved, and gives proper area for the tongue to function in swallowing and at the same time allowing the proper suspension of the structures of the neck and a normal condition of air passages. With this relationship obtained, we find that the facial dimension or measurement between base of nose and tip of chin agrees with a like measurement present in our patient's face at normal age. This evidence we get by relative measurements upon a photograph of the patient taken at this normal age. Thus instead of "taking the bite" we have secured as nearly as possible normal anatomical relationship and normal facial dimension.

This required restoration may be too great in many cases to be attempted with one set of dentures but must be put on a treatment basis requiring two or more sets of dentures. This is also true in the restorations on natural teeth where better results are accomplished by the use of inter-occlusal dentures, vulcanite or gold, without any cutting of natural teeth until proper dimension and muscular balance has been established.

Our research so far shows an almost universal lack of normal facial dimension in everyday denture construction. This condition gives condyle encroachment on the auditory meatus in a degree proportionate to the loss of dimension. Enough cases have resulted in impaired hearing to indicate the necessity of testing every case as a preliminary to reconstruction.

Ear Test

The ear test should be made in a quiet room and the same watch should always be used. The teeth should be in occlusion. Starting with either side place the watch close to the ear, gradually move the watch away from but in a direct line with the ear. As the timepiece gets close to the ear limit a look of concentration comes over the patient's face, and just as the limit is reached, as a rule, the jaws will open. Each ear is tested and a record made of the distance in inches of the watch from the ear when the patient acknowledges that the ticking can no longer be heard. The normal distance with an Elgin twenty-one jewel watch under favorable room conditions is twenty-eight to thirty inches.

If the test is far below normal and considerable condyle encroachment is present place pink base plate wax in the occulsion opening to what the condyle test shows to be about normal and test the ears again. With the relief of condyle

encroachment there is usually a difference of inches between the first and second test, the second showing a greater distance than the first. The amount of improvement depends upon the degree of condyle encroachment, age of patient, amount of dimension restored, and presence of other ear deformities. Also as a rule, there will be a greater improvement in the ear on the side showing the more pronounced encroachment.

Summary

Modern denture prosthesis must be recognized as a science comprised of several exact steps. First of all, we must be well grounded in the anatomy of the parts comprising the mechanism of mastication and the physiology of the first and subsequent steps in digestion. With this in mind, we are able to work out methods of impression taking with the idea always in mind of what we expect from our completed base upon which will be constructed the occlusion to a dimension which will restore normal anatomical relations. This, then, gives us a condition which permits a return of lost muscle tone and co-ordinate action, allowing the tongue to properly perform its function in deglutition. When the anatomy and function have been restored we find the osseous framework in a position which allows the soft tissues of the face to drape to their proper position eliminating nearly all the wrinkles and folds upon the face. As a further step, we must carefully study the art of aesthetics in setting up or arranging the teeth, because there must be harmony in the final facial result as well as restoration of anatomy and functions. We must not expect results in readjustments, as just stated, too quickly. Diplomacy on the part of the operator and great co-operation from the patient spell success finally. In this regard, dentures constructed with high buccal and labial rims will not permit the return of the lip and other soft tissues to their normal position. Great care is necessary to finally arrive at a height of denture rim which does not obstruct the draping of the tissue of the face.

THE RATIONAL STATUS OF RADIOGRAPHY IN DENTISTRY

By CLARENCE O. SIMPSON, M.D., D.D.S., St. Louis, Missouri

(Read before the Chicago Dental Society, December 21, 1920)

MANY of you may not at present be deeply interested in the development of this special phase of dentistry, or have given serious consideration to the prevalent evils under discussion, because they did not appear to have a direct effect upon your affairs. However, the abuse of any branch lowers the standing of the entire profession. This is particularly true of one which has an intimate relationship with most dental operations and is destined to become one of the important fundamentals of practice. From earnest study of the inconsistencies presented by existing conditions, the prophecy is ventured that most of you will soon concur with the seemingly radical statements to be made.

Radiodontia has been defined by Dr. Howard R. Raper, the author of the name, as the art and science of producing and interpreting radiographs of the teeth and contiguous structures. No attempt will be made to force this or other nomenclature upon you, but it is quite specific in limitations, more flexible than the former term "dental radiography and diagnosis," and conforms to the accepted terminology applied to orthodontia, exodontia, and periodontia.

The Effect of Oral Sepsis Propaganda Upon Radiography

The early investigation and development of radiography, or roentgenology, for practical use was almost entirely by physicists and the medical profession. Altho in 1896, Dr. C. Edmund Kells radiographed teeth, the inefficiency of the apparatus at that time made it more of an experimental stunt than a dependable process. The science steadily progressed, but dentists were rather dilatory in utilizing this wonderful diagnostic aid, for prior to 1910 there were few men with dental training operating X-ray machines. The necessity for X-ray examinations in dental practice was becoming evident, and the normal progress would have resulted in a gradual preparation and general adoption without present conditions arising. However, the reports of animal experiments, in the relation of oral sepsis to secondary and systemic disturbance, and some spectacular cures following the removal of teeth, precipitated a dental inquisition and an unprecedented impetus to oral radiography. In common with other revolutionary theories, this aroused intense interest and discussion, which resulted in exaggerated deductions. Lay writers seeking material to exploit and professional men not averse to sensationalism spread upon the pages of popular magazines and newspapers lured tales of death which lurked in the teeth.

During the past decade, teeth and dentistry have had more publicity than

the profession has been able to obtain for educational purposes during the century of its existence. The ultimate effect of this propaganda will be beneficial in teaching the importance of oral hygiene and in improving the character of dental operations; in the meantime many useful teeth will have been lost, the false hopes of many sufferers shattered, and many physicians and dentists humiliated. Some of the premature alarmists who rushed into print and upon the lecture platform before the guinea-pigs were cold have attempted to evade the responsibilities of their deeds, altho a review of the literature upon the subject permits little opportuntiy for misinterpretation.

Many physicians accepted the oral sepsis theory as the important etiological factor in all baffling cases, ultraprogressive dentists discarded clinical experience for 100 per cent vitality, and the susceptible portion of the public instituted an independent campaign to overwork the radiographers. This is not ridicule of the many indications for radiodontic examinations which existed before the frenzied wave of popularity, and which constitute a tremendous field in medical and dental practice. The X-ray should supplement the periodic oral examinations of patients by dentists, and a radiodontic examination should be included in the routine examinations by physicians, but these examinations should be for the purpose of accurately determining conditions, not perfunctorily for psychological effect.

Origin of the Commercial X-Ray Laboratories

The rapid sequence of events so greatly increased the demand for dental radiography that it could not be supplied, even in the customary negligent manner, by the general radiographers and technicians. This opportunity proved no exception to the unusual economic conditions, or even calamities, in which there are always some unprincipled men, alert to prey upon the public for financial gain. Technicians who had been employed in hospitals and private offices, men who had been demonstrating X-ray apparatus, and others even less qualified, became dental diagnosticians overnight. From this origin the commercial dental X-ray laboratories continued to propagate by a process of segmentation, thru apprentices launching independent enterprises as soon as they became familiar with the methods of producing films, and seducing the public. Some grafters of greater cupidity operate a system similar to the chain-restaurants, and Piggily Wiggily stores, with branches in different cities or different sections of the same city. Without professional training or ethical environment to conceive the establishment of a practice along humanitarian lines, these X-ray photographers resorted to the wiles of the disreputable merchant and the quack dentist by cut-prices, commissions, and deceptive advertising.

It might be expected that the commercial laboratories would appeal to dentists with a "shawl" practice, those who "send out their piece work" to mechanical laboratories and buy their supplies from a peddler, but it is inconceivable that a dentist with professional ideals, technical ability, and an intelligent clientele would become an accessory to charlatanism and subject his patients to the manipulation and alleged examination of whoever may be employed in the "shooting gallery." The term "shooting gallery" is particularly appropriate, because the lack of educational preparation leaves the rent and ammunition the principal items of expense, and the charge is

based on the number of shots, whether they hit or miss. Computing the fee upon a film basis is incorrect because it encourages one-film diagnosis, it offers the opportunity to sell films which have no value, and restricts those who use an unlimited number of films for thoro examination.

How Conditions May Be Corrected

Altho the situation is lamentable, it is only temporary and entirely remediable. Every state has laws regulating the practice of dentistry, which if enforced would put the ban upon unlicensed and incompetent X-ray operators at once. A radiodontic examination is an operation performed upon the patient, with the chance of traumatism, transmission of disease, serious electrical shock, and the pernicious results of excessive X-ray exposure, constituting a greater risk than the average dental operation. An additional menace is the incompetent opinions and diagnoses, and the folk-lore pathology, with which patients are regaled, but our state boards have taken no action to control this practice. The function of dental boards is to safeguard the oral health of the people in the respective states, but their activities suggest a desire to protect the dental profession rather than the public, since their procedure is carefully studied to win the favor of a majority of the profession in the states. If the Chicago Dental Society and the St. Louis Dental Society should pass resolutions condemning the laxity in restriction of radiodontic practice, and demand a strict enforcement of the laws, the State Boards of Dental Examiners in Illinois and Missouri would doubtless be alarmed until they could call a special session to conform.

Why have the advertising dental parlors no standing with the dental profession? We are told it was because they did not fulfill advertised promises; the service rendered was inferior; they advertised operations at fees lower than adequate service could be rendered; and they operated under fake firm names instead of licensed individuals. The dental X-ray laboratories do all of these things, but continue to prey upon the people unmolested. The dental profession is "all agog" over the peril of licensing hygienists to operate under the supervision of dentists, after being prepared by a perscribed course of instruction and training. X-ray mechanics perform more important and hazardous operations without the preparation and restrictions proposed for hygienists, but there has been no concern manifested about the results.

Commercial X-ray laboratories are tolerated because the discriminating portion of the dental profession know little about them and ignore them, while the "penny-grafting" portion utilize them to capitalize the fears of the ignorant by replacing questionable teeth with unquestionably septic bridges, performing absurd surgical (?) operations, and in many instances exacting tainted tribute from the laboratories by "fee splitting." These laboratories could not exist without the connivance of dentists, and would be eliminated if all dentists refused to accept films from an unlicensed operator, an incompetent operator, or one not conducting a practice in conformity to the recognized standard of service and ethics in other specialties.

There are marked indications of improvement in that the leading reputable dental journals will not accept advertising from commercial laboratories, and official action has been taken in some localities to restrain dentists from receiving commissions for referring patients. When more knowledge and discrimina-

tion are applied to radiographic diagnosis after dentists have been repeatedly misled in diagnosis and subsequent procedure, and a larger portion of the laity have become victims of inferior and dishonest radiography, a much higher standard of practice will be required and established.

Importance of Radiodontic Examinations

Whether or not the incompetent, careless, or quack radiodontic practice is a serious evil depends upon the importance of X-ray examinations in oral diagnosis, and the comparative value may be appraised by considering the principal sources of diagnostic data. Primarily, the personal and family history, which may have a bearing on the case, should be obtained. This is particularly indicated in efforts to determine the relation between oral sepsis and other disturbance, and the history of oral disease and dental operations often modify conclusions regarding existing manifestations. The subjective and objective symptoms should be given careful attention, as many cardinal diagnostic points may be elicited by pertinent questions and trained observation. In dental practice a tentative diagnosis, which is later verified, may often be made from the description of the symptoms by the patient before the mouth is examined.

The physical examination in investigation of oral conditions and local disturbance includes a general survey of the mouth, palpation of the soft tissues, percussion, thermal and electric tests of the teeth, transillumination, and the use of probes and explorers. When a more extensive physical examination of the vital organs and functions is advisable the information should be obtained from the physician on the case. Vigorous protest has been made against physicians attempting dental examinations and advising the removal of teeth, yet in dental literature there are often suggestions for the dentist to make examinations and perform laboratory tests, which are foreign to his training and clinical experience. Altho it is desirable for the dentist to be conversant with the technic and significance of all diagnostic methods, more value can be derived from consultation with the physician, and the courteous procedure will rebound to the credit of the dentist rather than jeopardize his prestige. The folly of usurping other fields is exemplified by some of our dental pseudoscientists, who have exaggerated the importance of a "blood count" beyond all limits of established pathological science.

Bacteriological evidence is highly valuable in diseases of the soft tissues, but the difficulty of securing uncontaminated specimens from pulp canals or periapical areas restricts the practicability of their application in dental and alveolar involvement. None of the methods enumerated, or any other than radiographic examination, will supply the information about obscure caries, the roots and investing tissues of teeth, pulp canals, or the state of unerupted teeth, which is essential to all dental operations excepting the polishing and the restoration of the coronal portion of the teeth. All other diagnostic methods were available in the past, and the import of X-ray disclosures is emphasized by the errors in diagnosis and the crude operations which flourished before the advent of radiography, the canals which were believed to be filled, the abscesses which were considered cured, and the teeth retained by splints after all other support was destroyed by pyorrhea alveolaris.

Disparagement of Radiographic Evidence

There is a noticeable tendency for some men, who pose as master-diagnosticians, to depreciate the value of radio-

dontic findings. In exploiting their ability, the usual statement is: "We consider the radiograph of minor importance in arriving at our diagnosis." There is a subtle motive and an obvious reason for this attitude. The motive is to give the impression that they have unusual diagnostic skill, amounting to histopathological clairvoyance, by which a diagnosis is reached without the aid of the X-ray or other common methods. The reason is apparent when you view the radiographs produced in the office of the master-diagnostician. The "we" and "our" to which reference is so often made in society meetings of recent years is intended to suggest a corps of graduate assistants or a professional group. The "we" is often only an officious retinue of cheap labor in white which with a "ticket window" in the reception room and a time-clock typifies a successful professional career. In some offices this force is augmented by a young graduate, who is described as a "comer" but who has not yet arrived and needs the money. The superiority of the omniscent diagnostician does not permit him condescending to such mechanical pursuits as radiography, and it is relegated to a hireling with inferior results which is a breach of confidence to patients.

A young lady under treatment for acne was referred for dental examination to one of the diagnostic authorities who proclaims the radiograph relatively unimportant. By what secret method a decision was reached, the radiographic evidence being limited to one film of the region, he recommended the removal of two teeth supporting a bridge. The film was inadequate because it did not include enough of the suspected area, the position of the teeth did not permit both being accurately viewed from the same aspect, and movement of the film during the exposure had materially impaired the diagnostic detail. A careful radiographic examination showed apparently efficient canal operations in the teeth without indications of periapical disturbance or marked marginal absorption. The acne promptly disappeared after a change in diet prescribed by the internist, and the abutment teeth are still functioning with no evidence of being a source of sepsis.

A prominent office-holder in dental organizations, in a recently published tirade against the modern tendencies in dentistry, claims he can determine the presence of 90 per cent of granuloma without an X-ray examination. That is some feat for the hand but of no assistance to less-gifted practitioners. Also, there has been much discussion regarding the interpretation of dental radiographs. One of these ill-advised leaders has repeatedly written that many of the so-called rarefied areas are coagulated organic matter resulting from escharotic medication. Doubtless caustic applications are injurious to periapical tissues and may destroy bone, but by what physical laws can coagulated organic matter in bone produce a radiographic record?

With the dire effects credited to oral sepsis and the admitted loss of 70 per cent efficiency in the use of artificial dentures, the decision between eradication and conservation must be influenced by radiographic evidence. The despotic institutions which handle patients by factory methods, and members of fanatical cults who believe themselves divinely inspired to purge the human race with biological falsehoods do not require any information beyond a trace of a canal operation to condemn teeth; conscientious men with a capacity for more than one idea desire all the evidence obtainable in deciding the issues

which have such a vital bearing upon the comfort and health of their patients.

Radiodontia as a Specialty

In view of the importance of radiodontic examinations, more consideration should be given to the methods which are favorable to the maximum results. Concentration to a limited field should markedly increase efficiency, and the advancement made in the specialties of medicine and dentistry indicates similar proficiency in practice limited to radiodontia; therefore, the best service may reasonably be expected from the men who have seriously assumed the responsibilities of the specialty. Radiodontia should not be viewed as an easy means of a livelihood for the inexperienced or decrepit; but as a most interesting vocation, rich in possibilities for enthusiastic workers who are eager and competent to grapple with its problems. Besides the essential technical training, the radiodontist should have an extensive clinical experience in dentistry, a broad conception of the interrelationship of oral and systemic conditions, and an inherent desire to co-operate with the dentist and physician for the welfare of the patient, without thought of personal aggrandizement. The radiodontist's cooperation should be additionally valuable because of his greater scope of observations in the variations of normal structures, pathological manifestations, and postoperative results from different procedures than would be encountered in general practice. Patients deserve the advantages of consultation between the dentist and radiodontist, since some dentists are not severe critics of their own operations, and progressive dentists solicit the opinions of the radiodontist as they seek all available sources of information.

The specialist serving a number of dentists can make the examinations more economically than (a service of similar quality) could be rendered by each of the dentists maintaining equipment and taking the time from other operations for occasional radiographic examinations, which consume more time owing to the inconvenience and comparative inexperience of the general practitioner. Altho the radiodontist should report direct to the dentist or physician, and not discuss the radiodontic findings with the patient, he is often able to increase or restore the patient's confidence by supporting the dentist in matters which are unjustly criticized. The only logical objection which has been offered to referring patients to a qualified radiodontist is the inconvenience of a visit to another office; but in this period of intense activity and transportation facility it is a negligible factor unless the distance or inaccessibility would entail unreasonable efforts.

Radiodontia by Dentists

Dentists located in remote residential districts of cities, or in towns without a radiodontist, and those avaricious men who lack the vision to refer patients for any service must equip and prepare themselves to honestly fulfill their obligations in this regard. An equal amount of study, experimentation, and experience is required to master radiodontia, as of other exacting technic; and the equipment should be of ample quality and capacity to eliminate the avoidable electrical and mechanical handicaps.

Most dentists have insufficient space for their convenience or to create a desirable impression upon patients. The contrast between mercantile establishments, commercial offices, and the usual dentist's office must be striking even to an unobserving person. The small ill-lighted waiting-room, the eight-by-ten operating-room with desk in one corner and another inclosed for a laboratory,

and a feeble aesthetic attempt at a "dressing-room" almost accommodating a chair is too characteristic for further comment. What astringent influence is there in the practice of dentistry which tends to make a miser of the man who spent his father's money so freely while in college? It is an economic absurdity for the dentist to labor in his humble quarters conserving the health of the nation when vast auditoriums decorated with barbaric extravagance are dedicated to the insipid plots and puerile buffoonery of motion pictures.

When a dentist decides that it is necessary for him to include radiodontia with his many professional duties for the best interests of his patients, he should have sufficient space to place the equipment in a separate room, and arrange a suitable dark room. By this plan, the danger can be reduced, the work can be done under conditions which favor better results, and the procedure presented with a dignity likely to secure the co-operation and appreciation of the patient. If circumstances do not justify this arrangement, it is probably a case of intensive salesmanship on the part of the dealer, or a fee intrigue of the dentist rather than rational indications for the installation of equipment. If the requisite time and thought are utilized for thoro radiodontic examinations, it will not be found more remunerative than equitable fees for other operations, and those who are only seeking easy money will find oil stock or a handbook more profitable as a side line.

Dentists the Dupes of Dealers

The advertising campaign of manufacturers and dental supply dealers to sell X-ray equipment to dentists features grossly misleading and often deliberately false statements. Knowing that dentists are uninformed about the essentials and relative merits of the apparatus, but are attracted by gaudy bric-a-brac, superficial efficiency, and fee fertilizers, the dealers with these arguments are conducting an intensive drive to sell radiographic equipment to every dentist who can meet the installments. This propaganda represents oral diagnosis to be a matter of machinery, radiography merely a pastime for the "nurse," and the presence of a mysterious cabinet in the office an automatic "fee getter" for men, who have never been able to command more than a liberal "tip" for any operation. The men who have devoted most of their lives to radiography are exceedingly modest in discussing their proficiency; the advertisements in dental journals proclaim it simple, safe, and sure if one buys a certain unit (a dental X-ray unit is a defective creation, from which some desirable appendages have been severed to make it more tractable). The other established manufacturers have not employed questionable advertising; only the local dealers, and the irresponsible assemblers of "trick" machines are using these methods to augment the harvest before the inevitable frost. The ill-effects of such argument is to increase the danger of injuries by depreciating the risk, to create false standards of efficiency by discouraging men from qualifying themselves to practice radiodontia, and to tempt men who need asepsis and fundamental technic more than paraphernalia. In accepting the statements of advertisements, many dentists may find themselves in the plight described by the farmer, who when he heard his neighbor had locomotor ataxia said, "Now that he has got the pesky thing, he won't know how to run it." With an idle switchboard, and a nitrous oxide outfit, which has long since gasped its last, standing as expensive monu-

ments to the insatiable sales craft of the dealer, the dentist is now flirting with a new decoy, the X-ray machine.

Radiodontia by Unlicensed Assistants

The plan of intrusting radiodontic examinations to an unlicensed assistant is not only a violation of the laws regulating the practice of dentistry, in which both the dentist and the assistant are offenders, but it restricts the examinations to a more or less indifferent mechanical procedure, without the anatomical and clinical knowledge so essential in securing data for an accurate diagnosis. Altho some of the young ladies, to whom this work has been assigned, have acquired considerable skill in routine operations, their remarks display a slight conception of the science in which their employment and often their employer's boasts proclaim them mistress. The increased danger to the patient, which is associated with a partial training of the operator, was forcibly illustrated in observing an assistant test and reduce a tube for a period exceeding two minutes, with the cone directed at and in proximity to the patient's head. When the operator was asked if she was not afraid to do that, she replied: "No, this tube is so hard I cannot hurt it."

Multi-Specialists

Another manifestation of the unsettled state of radiodontic practice, and the tendency to prostitute it, is the present epidemic of multi-specialists. Many estimable and capable exodontists, orthodontists, and periodontists have extended their field to include radiodontia and by periodically circularizing the profession with reference charts solicit practice in two or more distinct specialties. No attempt will be made to analyze the motives which prompt this, but it is obvious that the practice of any one of the specialties will tax the ability of one who endeavors to attain the maximum efficiency. In combination with other specialties, radiodontia serves as a "feeder" for the office, but receives minor consideration, and is usually in the charge of an unlicensed assistant. Altho this plan may be permissible in "main street" towns, "doubling in brass" has rarely carried anyone beyond an "acetylene circuit," and the laity is too familiar with modern methods to be deceived by repertoire specialists.

The opinion of thinking people toward these questionable combinations was voiced by an attorney, who was referred to a radio-exodontist to determine whether or not certain teeth should be removed. After inquiring about the multifarious activities of the alleged specialist, he said: "My God, that is a criminal combination; prosecutor, judge, and executioner in one, with a fee contingent upon conviction. I want an impartial trial for my teeth."

General Radiographers

Another method persisting as a relic of the past, which should not be expected to supply adequate radiodontic service, is that offered by most general radiographers. Those men who were pioneers in radiography accepted the dental problems as a legitimate part of their field, since a physician is popularly supposed to be an authority on all human ailments. Having no precedent for a guide in their experiments, they acquired and handed down a great store of general knowledge in radiology and deserve our appreciation for promoting the practical application of radiography in dentistry. However, modern radiographic diagnosis requires a thoro knowledge of anatomy, pathology, and clinical medicine, and the medical pro-

fession is recognizing that the entire body is too extensive and intricate for an individual to survey with the keenest scrutiny. Thru inclination or trend of circumstances, many general radiographers have become especially proficient in certain phases of diagnosis, such as bone lesions, diseases of the thoracic viscera, and gastro-enterology, until the major portion of their practice is special work. With this evolution occuring in radiography, the futility of "medical" radiographers retaining a comprehensive grasp of the complex dental problems is evident. For his own mental peace, for his professional prestige, and for the welfare of the public, the general radiographer should be relieved of radiodontia.

Conclusion

This is a discussion of principles, not personalities, and there is no intention to malign anyone who is conscientiously trying to practice radiodontia under unfavorable conditions. Criticism is unpleasant but often necessary to direct attention to objectionable practices and create sentiment to correct abuses. If the arguments have been truthfully presented, the logical conclusions are: (1) radiography is an indispensable adjunct to efficient dental operations; (2) radiodontic examinations should be made by one with dental training and clinical experience; (3) radiodontia has a legitimate claim as a distinct specialty; (4) commercialization of radiodontia is not conducive to the best interests of the laity or the advancement of the dental profession.

Chicago, as one of the foremost dental centers of the world, including in its professional ranks many distinguished dental scientists, should promote the prompt conversion of radiodontia to the standard of other dental specialists. There should be at least a dozen specially qualified men of unquestionable professional reputation practicing radiodontia in Chicago, and receiving the loyal support of the intelligent physicians and dentists of that city.

Whether this desirable change occurs quickly thru concerted action or as an evolution from years of disastrous experience, truth will prevail and earnest endeavor will be rewarded. The present irregularities have created no doubt in the minds of the men, who are striving for the advancement of the specialty, that radiodontia will ultimately demonstrate its unchallenged position with the honored specialties of dentistry.

Discussion

Hollis E. Potter, Chicago: I think the subject-matter presented by Dr. Simpson is worthy of due consideration and great praise. He has presented to us the relationship which should exist between the roentgenologist and the dentist and has made a strong plea for that proper relationship. He has made a special plea in dentistry for what he calls radiodontia, and he desires that those composing that specialty of radiodontia should be well equipped in X-ray lore and in all other necessary dental departments so that they can see all phases or aspects of the subject, so that their combined efforts will result in the highest and greatest good for the patient. In making a plea for this specialty he is doing a great thing for the dentists in Chicago.

He has brought out the fact that the necessity for dental X-ray work has been so great that young America has sprung forward to fill the gap. I do not wish to criticize any of the methods that have come into vogue in dental radiography. In the early days some of the methods adopted were excusable, but I do not know now whether they are excusable or not. However, the busy dentist, the man who has a large practice, is not able to do his own radiographic work. He must have some one associated with him who can attend to this part of his practice. Co-operation is very essential, so that a large number of dentists are able to avail themselves of the services of an expert radiodontist. For the sake of those who prefer to do their own X-ray work, there is one thing that has come out recently that will help them. A new stabilizer has been invented which will give the same current for the X-ray tube all the time, and that simplifies one end of the matter a great

deal. For those who use the services of some other person, it behooves the members of this society to see that there are developed in Chicago adequate persons for carrying on this work. The dental schools must prepare them.

In regard to the ethics of this work, I will read some extracts from the Constitution and By-Laws of the American Roentgen-Ray Society, which has been in existence twenty-one years.

"*a* The roentgenologist, being a consulting diagnostician, should reveal his findings only to the attending physician or surgeon who has referred the case to him, and not to the patient, except by the specific request or permission of such attending physician or surgeon.

"*b* It shall be unethical to claim superiority in diagnosis or treatment due to some secret method of apparatus, or improvement in existing methods or apparatus, held to be known only to the claimant.

"*c* It shall be considered unethical to advertise by circulating, either the medical profession or the laity with price-lists, description of office facilities, or to advertise by signs stating the medical specialty, or by statement of one's specialty in the public press or lists of telephone subscribers, or in the city, state, or national directories printed for general public use.

"*d* It shall be considered unwise (1) to accept as a patient anyone not sent by a reputable physician or surgeon; (2) to provide the patient or his relatives with plates or prints taken for diagnostic purposes."

Louis Schultz, Chicago: I depend upon X-ray films to enable me to determine certain conditions, such as the diagnosis of the presence or absence of granuloma at the end of a root of a nonvital tooth. Some years ago, before this method was developed, and before the importance of oral foci of infection was recognized, we used to perform so-called masterpieces of dental art by treating and filling old decayed roots, making them comfortable, and by the adjustment of a crown, useful, indeed, but which we find became regular cesspools, and at that time we thought we were doing a mighty nice thing. Today we are ashamed of this type of work.

Dr. Simpson has spoken about the importance of getting the history of these cases. The X-ray film is simply an aid in diagnosis. The history of the case is sometimes far more important. The history will tell us a great many things which will guide our judgment, so that with the aid of the roentgenogram we may render a diagnosis which will be more dependable. The symptoms presented by the patient, both subjective and objective, will often serve as a guide to us in arriving at a correct diagnosis; on the other hand we see cases where there are no symptoms present; the blind abscess or granuloma is an example. We often see a patient whose roots have been filled long ago and which have given good service for so many years that the patient feels they should be extracted; yet the roentgenogram shows an apical radiolucent area with or without destruction of part of the root apex. Proper extraction shows it to have been the cause of a great deal of systemic disturbance in that individual.

I want to indorse everything Dr. Simpson has said with reference to the commercial laboratory. That sort of institution is nothing more or less than an institution of photography, depending upon the X-ray apparatus for the production of pictures. A competent radiographer, however, is essential, and by that I mean a man who has had ample training to become thoroly qualified for this particular field; a man who is well versed in the gross anatomy of the parts he wishes to X-ray, and who knows the histology and pathology of the structures involved. Possession of that scientific knowledge coupled with ample experience in roentgenology is, I believe, a proper qualification to act as a competent radioprapher.

Finally, in the interpretation of X-ray films we must not lose sight of the fact that these X-ray films or radiographs are simply shadow pictures, that they merely reveal differences in densities of shadows. The correct interpretation of those shadows with full consideration of the clinical history of the patient gives us the most valuable data in arriving at a correct diagnosis as far as these cases are concerned.

Alonzo C. Tenney, Chicago: For the benefit of the dentists and radiographers present, speaking as the president of the Chicago Radiological Association, I wish to clarify the atmosphere regarding radiological work. Some have held aloof from membership in this association, feeling they might be contaminated by coming in contact with technicians, but we have accomplished the following things in a little more than six months; (1) the standardization of fees on a professional basis; (2) the elimination to a large extent, and with the avowed purpose of doing so absolutely and completely, of fee-splitting, rebating, and corrupt methods; (3) I believe that after January 1 laboratories owned and operated by those who are not registered physicians or dentists in the State of Illinois will be unable to secure a license to operate in Chicago. Only a reputable licensed practitioner of dentistry or medicine should be able to operate an X-ray machine in a hospital.

I am not a dentist; I am a medical diag-

nostician. But we want your co-operation. We have started a big movement to clear up what has become one of the cesspools of medical and dental practice in the radiological field especially, where the work has been carried on as a commercial proposition.

Frederick F. Molt, Chicago: One thing we do not agree on is the matter of the amount of penetration to use in producing a radiogram of proper texture. Dr. Simpson produces radiograms that are wonderfully beautiful, and he has the artistic temperament which is so desirable and requisite for the perfect radiodontist, but I still think that lighter radiograms are better. Dr. Potter also produces excellent dental radiograms. And when I see Dr. Potter's radiograms I know they are always interpretable pictures and are not distorted.

I was glad to know that Dr. Simpson draws a line of demarcation between interpretation and diagnosis. The interpretation of a radiogram is the reading of a radiogram without any adjunct, while diagnosis means, as Dr. Schultz has pointed out, the correlation of the interpretation, the history, the symptomatology, and the clinical findings. Technicians are not in a position without knowledge of the clinical findings to bring out all these points, and therefore, the diagnoses that often accompany radiograms are necessarily fallacious. A knowledge of anatomy is essential, and should be added to by observation of the teeth and of the pathological conditions of the teeth as they are being operated. Some radiographers have the good sense to observe the cases they radiograph during operation and gain their knowledge in that way. Others depend entirely upon guesswork.

There is one point that should be stressed, and that is the wilful disregard of the radiographic findings by some of the men in our profession. Some men say the radiogram is undependable. It is not the radiogram that is undependable, it is the interpretation in so many cases that is open to criticism, for conditions that are manifest are absolutely or purposely disregarded.

Some years ago, when Dr. Charles Mayo made his epochal statement before this society regarding the dentist's place in the field of preventive medicine, and was embraced with open arms by all the members of the profession because dentistry was coming into its own, we accepted the theory of focal infection on its face value. Now there seems to be a tendency on the part of some members of the dental profession to belittle and discredit all the findings in this line.

The time will come when the surgical removal of teeth will be as accepted a procedure as anything else in the profession. Dr. Simpson is a little inconsistent in that he advocates extensive devotion of time to producing radiograms, but does not seem to adapt the principle to the operative end of the procedure. "Wing-shot" extractions do not achieve results.

I hope Dr. Simpson will answer the one question of what he would consider an adequate fee an oral radiographic examination, and how much time should be devoted to it for that fee.

Dr. Simpson (closing): Dr. Molt asked what I considered adequate in the way of time and fee for a thoro examination of the mouth. It varies in different individuals, depending upon the co-operation of the patient and the necessary work to be done. Roughly speaking, I should say that a minimum fee for a thoro examination of the mouth would be twenty-five dollars, and the minimum fee of a radiodontist for even seeing a patient for diagnostic purposes should be, at least, three dollars, and from that amount on, depending again upon the time devoted by the man who has professional training. If he has not had that professional training and is not well equipped for this work he naturally would accept a lower fee than that; that is, he has either to neglect the work or he is not adequately paid for it. That is only in reasonable proportion to other dental fees at the present time. It all depends upon the viewpoint.

This discussion has shown a variety of views, and after all, we must change our viewpoint of practice in these things, and my side of the discussion was only to promote a further study and consideration of this specialty and to help to develop it.

THE DENTIFRICE PROBLEM

By WILLIAM J. GIES,[1] New York City

(Read before the Illinois State Dental Society, Peoria, Illinois, May 10-12, 1921)

TWELVE years ago Dr. J. Morgan Howe, of New York City, asked me to co-operate with the local dental society in the study of salivary anomalies and their possible relation to dental caries. I was, then, I believe, like a fairly typical member of the average medical faculty—I felt that "teeth were teeth," more or less to be ignored from the dynamic standpoint, not at all interesting physiologically, and never figuring importantly in serious physiological considerations. I remember I was much impressed by the fact that Dr. Howe, a man of about seventy, appealed to me, a relatively young man. I was more impressed by that than by his proposal itself. We began, promptly, a study of the possible relationship between the composition of saliva and the condition of the teeth. From that time my interest professionally and scientifically in dental problems has been steadily cumulative.

In the course of these studies it soon became evident that one of the points of special contact between biological chemistry and dentistry was the dentifrice problem. It was obvious that the usefulness of a dentifrice, if any, was essentially a physiological matter. Subsequently, we undertook a study of dentifrices from that point of view, and have been proceeding in an effort to comprehend the facts pertaining to the utility and quality of dentifrices.

It has long been considered essential that a dentifrice should be alkaline in order that it may neutralize the acid on the teeth when the dentifrice is applied to them. You understand, also, that practically all dentifrices, except mouth washes, contain solid material for the removal, by friction, attrition, or abrasion, of solid material from the teeth. The frictional agent and the neutralizing agent have commonly been regarded as the two essential features of the most useful dentifrices. To these have been added flavoring materials, to give the dentifrice an agreeable taste and power directly to stimulate the flow of saliva as an aid in the desired process of neutralization of "mouth acid."

A newer conception of the matter, and the one that I have personally been urging upon dental notice, and to which I ask your special attention, is a dentifricial method that would use an agent for the removal of dental plaques, tartar and debris, not only *by friction*, but also by a process that is essentially *chemical* in part, and *which would not damage the enamel*. We have found, in support of this idea, that the mucin plaque, the

[1]William J. Gies is editor of the *Journal of Dental Research* and head of the biochemical department of Columbia University, College of Physicians and Surgeons.—Editorial note.

mucin film or adhesive on the teeth, can be broken and disintegrated and the mass disengaged, more effectively and more promptly, by the use of a *suitably* acid mixture than by any other means, and without damage to the teeth. A corollary to this newer view is the further conviction that the neutralization of the acid in the mouth by a dentifrice, *at the moment when that dentifrice is applied* to the teeth, is not the all-important hygienic consideration in this relation. The fact is that such neutralization of "acid mouth," if it is important, can be accomplished effectively by properly brushing the teeth with a suitably acid agent that causes alkaline saliva to flow profusely while the teeth are being brushed and for a short time thereafter.

In order that this general conception, which runs counter to general opinion and may seem to disregard experience, may not seem to be absurd, permit me to allude to one or two simple things that are apt to be overlooked or ignored in discussions of this problem.

All acids are compounds of hydrogen. Boric acid is a compound of hydrogen; sulfuric acid is a compound of hydrogen, and so on. If we wish conveniently to use a very general formula for acids, we might select H—R to mean any acid, in which H stands for hydrogen and R for all the rest of that acid. Every acid may be represented, in principle, by that formula: H—R. It happens that when acids are dissolved in water they dissociate, with some exceptions, more or less completely into the H part and the R part, that is to say, into H and R ions. The acidic effect of a substance (dissolved in water) is an expression, in the main, of the influence of the H-ions of that substance in the proportion involved. That fact is the key to understanding of all ordinary acidity effects in physiology or pathology.

One of the exceptional acids is boric acid. Dissolved in water, boric acid dissociates so slightly into H and R as to be practically undissociated. Boric acid, even in concentrated solution, can be put on the eyeball without damage to the eye—it can be applied to the eye, in *saturated* solution, with actual benefit to the eye under certain conditions! Think of putting vitriol on the eye, however! Sulfuric acid is a highly dissociable acid—yields H-ions freely; but boric acid is practically undissociable—yields H-ions very "reluctantly." When you think about effects of acids on the teeth and in the mouth, do not recall only the effects of concentrated sulfuric acid thrown on somebody's face, but think also of the effects of application of a saturated solution of boric acid to the eyeball as a common therapeutic expedient. Then you will realize the important difference between the two extreme types of acid and will see that there are "acids and acids." There are many gradations in dissociability—capacity to yield H-ions—between these two extreme types of acids.

Acetic acid is another acid that dissociates only slightly. Even a 5 per cent solution of acetic acid, in water, is quite weakly acidic because only a small proportion of its hydrogen has gone into the ionic condition. Hydrochloric acid, on the other hand, whether it comes into the mouth from the stomach or with ferric chlorid from a bottle, yields its hydrogen readily in ionic form and is strongly acidic.

For these reasons one may deal with a "strong solution of a weak acid"— saturated boric acid solution, for example— or with a "weak solution of a strong acid," such as 0.2 per cent hydrochloric acid in gastric contents; and vice versa. There is often confusion in this relation. One may have a "strong" (concentrated) solution of boric acid (a weak, poorly

dissociable acid), which, put on the eye, will exert no deleterious influence; or a "weak" (dilute) solution of hydrochloric acid (a strong, richly dissociable, acid), which, on the eye, will have a bad effect.

Mucin is a weak acid that is insoluble in water. It is an acid protein and a protein acid. Let us use the letter M to represent that part of mucin that is not displaceable hydrogen. There are several displaceable hydrogen atoms in mucin. One general formula for mucin may be conveniently written, therefore, HX—M. Salivary mucin is a little stronger in acidic action, in some respects, than boric acid, but much weaker than acetic acid, or tartaric acid, or citric acid—common "food acids."

When salivary mucin is produced in the salivary glands, most of it is made to react there with such basic elements as sodium and potassium, and several compounds, mucinates, result. These mucinates are analogous chemically to the types of phosphate, as indicated by the two following illustrative formulas (for two sodium mucinates): HX_{-1} Na—M and HX_2 Na_2—M. The hydrogen atoms are replaceable by one or more sodium atoms. The more sodium with which the mucin combines, for example, the more soluble is the compound, and vice versa. Mucin itself is insoluble in water. Saliva ordinarily contains a mixture of these types—soluble mucinate, and insoluble mucin and mucinate. Perhaps you are familiar with the fact that if you expectorate into water and stir up the mixture a fairly abundant supply of stringy material may be separated. The stringy substance is a mixture of mucin and mucinate containing a small proportion of base—all insoluble in the water. If you add alkali to saliva, the mucin and mucinate therein are converted into the mucinates containing relatively large proportions of base—all soluble in water. Such alkalized saliva mixed with water does not yield the stringy insoluble matter.

When saliva enters the mouth and bathes the teeth, the mucinous matter (mucin and mucinates) being more or less adhesive, sticks to the teeth in favored places, where friction does not dislodge it, and mucin films or plaques may be formed there. These masses, with bacteria that may be held in them and debris that may be added to them, become a visible and destructive feature on the surface of the teeth. Such films are difficult ordinarily to remove.

When one applies an alkaline solution, such as lime water, to a mucin plaque, alkali reacts with and enters the mass and makes a soluble calcium compound of the mucin—calcium mucinate. The mucinate swells and becomes viscid: but tho the mass is softened, it is not easily disengaged from its close contact with the surface *because of its adhesiveness;* altho in the *continued* presence of an *excess* of alkali, the film gradually dissolves. The bristles of a toothbrush, when the latter is applied to the teeth in the ordinary act of brushing, are apt to pass thru such a viscid film, after it is changed by alkali, without dislodging it; and the bristles may not completely remove the viscid mass, even by vigorous use of a brush. Anyone who has tried, with the aid of lime water or soap, and friction, to wash mucinous matter from a handkerchief containing nasal mucus knows how difficult it is to remove all the mucin from its attachments, under such conditions. The purpose to remove such mucinous material from the linen requires special effort when alkaline reagents are employed, apparently solely because of the adhesiveness of the viscid mucinate pro-

duced from the mucin by the applied alkali.

Altho mucins dissolve in alkali, they do not do so readily under certain mechanical conditions, such as those pertaining to mucin plaques on teeth and nasal discharges in handkerchiefs. The conventional method of separating mucin from its alkaline solutions, that is, from solutions of mucin salts (mucinates), involves the addition to the alkaline solution of *acid* in sufficient quantity to impart a *very slightly acid* reaction to the fluid when the alkaline and acid portions are thoroly mixed. The acid thus added to the mixture, under such conditions, withdraws the base from the salt and produces the mucin acid, that is, the true mucin, which, being entirely insoluble in the medium thus created, is curdled, i. e., separates in flakes. These flakes are *devoid of adhesive quality.* The reaction involved in this flocculation may be indicated, in a general way, as follows:

$$\underset{\text{Di-sodium mucinate (Soluble)}}{H\mathbf{X}_2\ Na_2\text{—}M} + \underset{\text{A soluble acid}}{2\ H\text{—}R} = \underset{\text{Mucin (Insoluble)}}{H\mathbf{X}\text{—}M} + \underset{\text{A soluble salt}}{2\ NaR}$$

These facts imply that an effective way of removing a mucin plaque from a tooth, and mucinous matter from a handkerchief, would be the application of a medium that would impart to each a slightly acid reaction. The mucinate, in each case, would be curdled, flaked; it would lose its grip and could easily be flushed away. This is the chemical basis for my long-standing recommendation that "food-acid" media be used for the removal of dental mucin plaques. Some laundries use this acidic method to "wash" mucinous matter out of linen.

If these statements fully represent the facts, and if acid media can be included in dentifrices *without damage to the teeth,* you would naturally conclude that the use of suitably acid dentifrices would satisfactorily accomplish complete removal of dental mucin plaques, which you regard as important mechanical factors in the etiology of dental caries. Such dentifrices, you would agree, would be particularly useful agents in the art of keeping teeth clean, provided they did not harm the teeth.

I presume you will be inclined to believe that the chemical facts I have presented are, in principle, merely conventional biochemical knowledge. I cannot expect you to believe, however, that acid media may be applied to the teeth as dentifrices without damage to the teeth, unless essential facts are summarized in this relation. Permit me to present some of the "essential facts."

Paleontologists agree that man has ascended from a succession of species of animals that have fed very largely on fruits, all of which were acid in reaction. There is a fair presumption, accordingly, that the ingestion of acid foods, thru the ages, has not materially damaged the teeth of the so-called average individual in each successive race from which man has ascended, nor of man himself.

Nearly all the masses of food we eat are acid in reaction, some of them, such as fruits and ordinary salads, being quite decidedly so. Anthropologists have reported that the teeth of fruit eating savage races, and of such groups of civilized people as the Sicilians, who eat large amounts of citrous fruits, are uncommonly fine in all respects.

Many of the lower types of animals feed largely on fruits (all of them acid)

without discernible detriment to the teeth as a consequence, and certainly without *practical* damage to the teeth.

Fruits such as lemon and orange, acid always, are among the types of food that prevent scurvy, and facilitate the development and maintenance of *normal* dentition — certainly not deleterious effects.

Natural extracted human teeth, containing typical fillings of various kinds and set in "artificial jaws" of paraffin, were brushed twice daily for five years and one day (1913-18) with a mixture of equal parts of water and vinegar, without causing any damage to the enamel that could be detected by a committee of dentists of the First District Dental Society of the State of New York. (The vinegar-water mixture was selected for this *test* because it represented a degree of "food-acidity" that would probably be regarded generally as "too high for safety." It was felt that the "food-acid theory" should be tested with a mixture close to the *maximum* degree of food acidity rather than near the minimum, on the assumption that, if an unnecessarily or undesirably high degree of acidity did no harm, *all lower degrees of acidity would assuredly be harmless.)*

The most acid foods, such as fruits, are the most active stimulants of the secretion of saliva containing high degrees of alkalinity and low proportions of mucin and mucinates. The ingestion of such acid foods is followed by an "after-flow," to some degree, of saliva of high degrees of alkalinity—greater power to neutralize acid!

The juices of such mildly acid fruits as apples are strong enough to curdle and dislodge dental mucin plaques. Who will contend that the ingestion of apples as food is undesirable for any dental reason?

Undiluted grape-fruit juice may suitably be, and is very commonly, eaten with a spoon. Why may not such juice be applied, *diluted* especially, to the teeth with a toothbrush?

Does any dentist object to the drinking of carbonated waters because they are acid in reaction?

I believe I am fully justified in stating the conviction that, if the mucin plaque is a mechanical factor in the etiology of dental caries, the removal of such plaques may be satisfactorily effected, chemically, physiologically and hygienically, by the ordinary use of suitably selected dentifrices containing "food-acids" in proportions lower than those in fruits such as oranges.

For twelve years I have been presenting this opinion to dentists with the suggestion that the idea be tested clinically *by dentists.* I have declined to exploit the idea or to derive any financial advantage whatever from its evaluation by others. I appeal to you to test the matter for yourselves individually, *with ordinary food-acid media in simple ways* to suit your own ideas in the matter of procedure.

Several years after I made the suggestion that "food-acid" media are desirable constituents of dentifrices, Pickerill published the same proposal. We arrived at the same conclusion, but by different routes and for different reasons. Pickerill ascribes the advantage derivable from the use of acid dentifrices to the stimulating influence of such acid media on the production of alkaline (acid-neutralizing) saliva. My own idea has been that the benefit accruing from the use of a suitably acid dentifrice is primarily due to direct disintegrative action on mucin plaques and only secondarily (tho importantly, too) thru the long-known stimulative influence of acidity on the secretion of saliva.

There appears to be a growing tend-

ency, in the dentifrice trade, to adopt the principle underlying the views Pickerill and I have published. This "growing tendency" seems to be the result of increasingly favorable dental opinion of available dentifrices compounded on the "food-acid theory."

Before concluding I ought to refer to several other important phases of this subject, to prevent possible misapprehension.

The direct attacking and destructive agent in superficial enamel decay—in the initial phase of caries—is acid produced by bacteria, supposedly lactic acid. (Lactic acid is one of the "food-acids"—a constituent of sour milk, for example.) How would an acid dentifrice prevent or retard the action of lactic acid and similar acids produced on dental surfaces by bacteria? I answer: By *completely* removing the mucin plaques and debris in which bacteria are actively engaged in producing lactic acid and similar acids, and also simultaneously by washing away any *accumulation* of such acids. This would be accomplished as often as the dentifrice would be effectively used; and, by the *completeness* of the removal of the plaque, would particularly *delay* the development of *new* destructive centers of fermentation on the teeth.

If lactic acid, or similar acid, is the destructive agent in the initiation of caries, why does not the acidity of the various fruits also damage the enamel? Again I reply: In the initiation of caries the acid is produced molecule by molecule *continuously* at a *given point*, whereas the presentation of "food-acid," in food or dentifrice, does not involve continuous *production* and *replacement* of active acid molecules at any point on a tooth. "Water dropping day by day will *wear the hardest rock away*," but the same amount of water poured over a rock by the barrel would merely *wash* the rock.

If "food-acid" is useful in a dentifrice, why does not the mere ingestion of fruit keep the teeth clean? I believe the *regular* ingestion of fruit—apple, for example—*does* keep clean the dental surfaces *that are freely swept by the fruit juice and particles.* The juice from ingested fruit, however, is rarely if ever passed effectively over *all* the dental surfaces by the process of mastication or otherwise. Besides, fruit particles containing highly fermentable matter tend to lodge on and between the teeth, and thus may favor fermentation and *local* production of acid. A dentifrice of the same kind and degree of acidity, however, would contain no such fermentable matter and would be *effectively applied* (?) as a cleanser.

Finally, what may be expected of *any* dentifrice if it is not used often enough, or is *not applied effectively* enough to the surfaces of the parts of the teeth on which fermentable matter lodges or is retained? What is the therapeutic value of the best medicine while it remains in a bottle or when it is thrown to the floor? Can the face be kept clean by frequently and thoroly washing only the hands with soap and water?

Has the *mechanical* process of applying dentifrices attained the degree of perfection that is required by the necessities of successful oral hygiene and by the ideals of preventive dentistry? This question, to which I believe our unanimous answer is no, carries me to and beyond the edge of my "problem."

Discussion

E. D. Coolidge, Chicago Illinois: Dr. Gies is a scientific man who is studying this problem in the research laboratory and is giving us information that will place us in a position not to be misled by the various advertisements for dentifrices. The manufacturers pick up new ideas from dental literature and

place them in large type on their circulars as they have done with the acid or pepsin theory. They are just as apt to put something in print that will mislead the dentist as the public, and in this way derive a great deal of benefit financially from an unsuspecting public; in other words, they capitalize ideas that are founded on facts established by scientific investigation but their product which they advertise is oftentimes valueless.

The character of the saliva I believe is of very great importance in mouth hygiene. The character of the saliva is affected by the food we eat, especially by fruit acids, whether in the form of a dentifrice or by the fruit itself. I have been converted to that for many years and have tried it in my own life and have found that it gives results. The character of the saliva is not affected only by fruit acid as it relates to oral hygiene, but may be affected by other things that we eat. The natural tooth wash is saliva. The more viscid the saliva, the more difficult it is to remove the deposits from the teeth, the more the deposits will settle upon the teeth and the greater the need for mechanical friction to maintain mouth hygiene.

I believe Dr. Gies made a statement of the greatest importance when he spoke of the necessity of getting a dentifrice upon the tooth, but not so much from the standpoint of the dentifrice dissolving the bacterial plaque upon the tooth as from the act of getting it on the tooth and the rubbing that will mechanically break up the mucinous plaque and remove it.

He has given us the chemistry of the formation of the plaque, and has told us that organic acid will make it much more easy to remove. There is no question but that this fact is important. But let us not forget the fact that mechanical friction is the important thing in removing material from the teeth. The character of the saliva has a great deal to do with the difficulty of removing these plaques. It has also a great deal to do with the amount of deposit that forms upon the teeth and the need for that friction. By improper diet it is possible to make it necessary to brush the teeth frequently to keep them clean, while it is also possible to be able to keep the teeth in a very clean condition with considerably less brushing if the diet is properly regulated in quantity as well as in quality. The amount of deposits upon the teeth may be considered a barometer which indicates an excess of diet. The deposits must be kept off from the teeth to maintain mouth hygiene, because the latter depends not only upon freedom from dental decay but also upon gingivitis, and deposits of calculus are a very important factor.

Arthur G. Smith, Peoria, Illinois: This remarkably searching, clear-cut, contribution is one of great interest to all of us. While one swallow does not make a summer, nor one "history" a rule, I cannot refrain from citing a case which I think will be of interest to all of you and to Dr. Gies.

I had a patient sixty years of age, whose teeth were in a remarkably fine condition. No dental caries had appeared in his mouth for forty years and his teeth were absolutely free from deposits. I asked this man as to his dietary habits. He said: "I eat anything I can overtake, but I suppose I do one thing that is a little out of the ordinary. Every night before I go to bed, after I brush my teeth, I eat two oranges if they are large ones, and four if they are small ones."

Otto U. King, Chicago, Illinois: There are few persons now who have not the conviction that the scientific cleansing of the teeth and gums is very valuable, and the business in antiseptic dentifrices is obviously increasing, judging from the numerous public advertisements which appear in the daily press setting forth the merits of a great number of these preparations. Generally speaking, they are so composed as to render them well adapted for the purpose, and we have subjected a number of them to analytical examination. The choice of antiseptic is commonly confined to carbolic acid, thymol, peppermint, boric acid, benzoic acid, eucalyptus and other essential oils, distributed in vehicles containing as an agent of attrition non-gritty chalk and as an alkaline medium soap. Experiments are usually quoted as to the actual germicidal value of these preparations in vitro, but, of course, it would be more satisfactory to have evidence of their real effect in the mouth, where very different conditions must, as a matter of fact, exist. The use of a tooth wash does not approach the conditions of a laboratory test, tho there can be little doubt that a great deal of germicidal work in the mouth is done by the vigorous application of the toothbrush, and it may be pointed out that the tongue may well be included in the process. To be effective, however, the action of all antiseptics takes time, according to the vitality of the organisms they encounter, and usually the toothbrushing process does not occupy many seconds. The question of time-exposure is important, but it is very generally overlooked, and consequently the antiseptic treatment of the teeth falls short of that effectiveness which is shown to be the case in laboratory experiments. The tooth-washing process should be more prolonged, and the antiseptic wash allowed to remain in contact with the teeth and gums for some minutes, instead of seconds, before finally washing the mouth clear of antiseptic with plain water.

It is a matter, perhaps, for discussion as to whether it is desirable to use tooth pastes

or washes which are very strongly bactericidal. The objections offered may be summed up in two statements, namely: (1) that substances which would destroy bacteria injure the mouth mucous membrane; (2) that many mouth bacteria are normally found there, and their activities are probably of some importance in the preparation of food for digestion, and these bacteria would be destroyed along with the pathogenic bacteria. Whether these statements are true or not, there occur in the advertising of tooth pastes and mouth washes frequent claims as to the bactericidal power of these preparations.

On this account it seemed wise to make tests which might confirm or disprove such statements. Mouth bacteria were taken from badly infected mouths, selected from patients presenting at the Northwestern University Dental School Clinic.[2] Suspensions were made of these bacteria in salt solution and the inhibiting power of tooth paste emulsions tested on cultures made from these suspensions. The tooth paste emulsions were added to the cultures so that their action was not confined to five or ten minutes of time, but thruout the twenty-four to forty-eight hours that the cultures were incubated.

While it is true that they were used in the strength of only 1 per cent of the original paste in the culture plates, i.e., 1 c.c. of a 10 per cent emulsion in 10 c.c. of culture media, yet the bacteria were exposed to the inhibiting action of the emulsion from twenty-four to forty-eight hours, as stated.

This work, to be reported, is merely preliminary to a study of the inhibitory action of the tooth paste emulsion in other dilutions and with all factors arranged to correspond to conditions which obtain in the average cleaning of the teeth.

Final conclusions can only be arrived at when the bacteria are exposed to comparatively high concentrations of the tooth paste for five to ten minutes. But after testing the inhibitory action of ten different tooth pastes purchased at random from various drug stores, it may be said that in these low dilutions the growth of mouth bacteria is not materially retarded.

By adding litmus solution and lactose to the culture plates it was possible to demonstrate also that the growth of the lactic acid forming bacteria was not retarded.

Out of these ten plates there were three in which it was possible to say that in the plates containing the tooth paste emulsions the bacterial colonies were smaller and slightly less numerous than the ones in the control plates, and one in which the culture media immediately turned pink on the addition of the tooth paste emulsion because of its acidity.

Bacteria grow in an alkaline media; therefore an acid substance would inhibit their growth.

Dr. G. V. Black contended that we were approaching the time when we can expect to produce an immunity from caries either from physiological conditions or from treated conditions in the saliva itself.

Dr. Joseph P. Michaels, Paris, in his *Sialo-Semeiology*, says that if there is a balance (not artifically produced) of sulphocyanide of potassium and ammonia in the saliva, there will be no caries. Up to the present time it has been impossible to produce this immunity artificially.

In diphtheria the injection of an antitoxin will prevent the pathogenic activity of the diphtheria bacillus in the individual. Autogenic vaccines will eliminate from the mouth pus-producing germs for certain brief periods of time. If that can be produced artifically, why cannot a similar immunity be produced in regard to caries of the teeth?

Therefore the real scientific research problem confronting the dental profession today is the problem of securing an immune condition from caries in the saliva.

In conclusion I want to stress this point, namely, I am not ready to admit that there may not be some real virtue in tooth paste or powder containing anti-substances. If we have inhibited the growth of bacteria in the saliva for even a brief period of time, it would seem that we have at least started on the road to immunity from caries of the teeth. Scientists who are trying to solve the problem of prevention of dental caries by any methods should be encouraged and such men should receive the moral and financial support of the dental profession.

Arthur D. Black, Chicago, Illinois: I would like to mention four things which we should keep definitely in mind in connection with this subject: (1) Acidity of the saliva has absolutely nothing to do with decay of the teeth. (2) It is only that acid that is held in contact with the teeth under the gelatinous plaques which causes the teeth to decay; the gelatinous plaque prevents this acid from becoming mixed with the saliva. (3) Antiseptic mouth washes have no value whatever in preventing decay of the teeth or in bringing about immunity. (4) Certain acids placed in the mouth have a tendency to inhibit the action of lactic acid-forming micro-organisms, and also a tendency to dissipate the plaques.

It will be noted from these statements that

[2]Experimental work conducted at Northwestern University Dental School Clinic and Research Laboratory, by O. R. Buttner, D. D. S., under the direction of E. H. Hatton, M. D.

any substance taken into the mouth which would dissolve the gelatinous plaques, thus permitting the lactic acid to become mixed with the saliva, would tend to prevent decay.

Dr. Gies (closing): May I allude briefly to one or two items in Dr. Coolidge's remarks? One is the difficulty of removing mucin plaques by friction. I referred to the mechanical difficulty of getting mucinous matter out of linen with the aid of alkalies. It is a well known fact that relatively great force is required under such circumstances. With the acidic treatment, however, the mucin may be removed without trouble. The acid flakes the mucin and the flakes, having no adhesiveness, may be readily flushed away.

Dr. Coolidge's remarks about the effect of various things on the secretion of saliva suggest additional comment. The kind of substance which, taken into the mouth, makes saliva least mucinous, most watery, most alkaline, and nearest to what is supposed to be the physiological ideal, is "food-acid," such as that in ordinary fruit.

There is nothing you can take into the mouth that makes saliva as thick, as mucinous, or as adhesive as sugar. Abundance of sugar in the diet is believed by many physiologists to account for much of the progress and apparent cumulative increase of dental caries among civilized peoples, for sugar not only makes the saliva thick and favors formation of mucin plaques, but it also provides a suitable pabulum for localized bacterial production of acid. If candy is eaten before retiring, and any of it remains in the mouth, a considerable degree of acidity may be produced and localized during the night—and appreciable harm to the teeth, "in spots," may thus be registered during a period of six to eight hours.

Dr. Black's father suggested the use of purgatives to prevent deposition on the teeth. Newer findings emphasize the significance of that expedient. Intestinal putrefaction and fermentation result in the production of solvents of calcareous material in the large intestine, and tend to increase the proportion of calcareous substances in the blood. The salivary glands are very active in excreting such substances into the mouth.

We know that hard tartar is deposited largely because carbonic acid is discharged from the soluble bicarbonate in the saliva. The saliva becomes more alkaline as the carbon dioxide is discharged from the bicarbonate, and calcium carbonate and phosphate tend to be precipitated simultaneously. A relatively abundant salivary excretion of bicarbonate and phosphate of calcium, for any reason, and discharge of carbon dioxide after the secretion emerges in the mouth, induce relatively heavy deposition of the ingredients of hard tartar. The activity of the salivary glands, and their tendency to excrete much or little of these substances, are plainly involved.

I cordially endorse what Dr. Coolidge has said on the destiny of oral hygiene: the problem is not merely one of means of removing from the teeth something already deposited there of unhygienic tendency, but also one of methods of *preventing* development of unhygienic dental and oral conditions. Sooner or later the latter and more important phase will receive the scientific and experimental attention it assuredly deserves.

THE DENTAL ASSISTANT: PAST, PRESENT AND FUTURE

By MARY MIDDLETON,[1] Sioux City, Iowa

(Read before the Dental Assistants' Section of the Iowa State Dental Society, Des Moines, Iowa, May 2-5, 1921)

THE history of the rise and development of the dental assistant is necessarily closely related to the history of the dental profession, and can best be understood by a brief review of the history of the development of that profession. We must ever bear in mind that we are essentially the handmaidens of dentistry, and that each period of dentistry has called into existence its own particular type of assistant.

The progress of the dental profession logically divides into three periods, marked off as such by the attitude of the profession toward disease. That period which we may term the past reaches from the earliest efforts toward the relief of dental pain to the discovery of the fact that diseases of the teeth and gums are frequently the cause of diseases in other parts of the body. That period which we may term the present dates from the above-mentioned discovery to the practice of dentistry as we now know it. The period of the future may be reckoned from that time when dentistry will be recognized as a specialty of medicine, and be so practiced.

Turning now to the dentist of the past, we find him to have been a clever mechanic, a skilled artisan whose chief occupation, aside from the relief of pain, was the restoration of lost or crippled organs of mastication. As such, he worked alone, even to the extent of locking his laboratory against the prying eyes of a chance visiting dentist, so jealously did he guard his methods. Naturally, we find that the assistant of that period was not in the true sense an assistant; rather was she a maid—as indeed she was often so called—whose chief duties were to assist patients with their wraps, look after the children, run errands, etc.

With the advent of root-canal operations, the use of the rubber dam, and gold foil fillings, the dentist had need of help at the chair, and we find the maid being advanced to the position of an actual assistant. But let us bear in mind that the dentist was still an artisan, perchance an artist, but with no well-defined idea of the relation existing between oral and systemic disease. This was necessarily true, for our present-day science of bacteriology had not yet taken form.

Then came the discovery that bacteria, which were present in one part of the body, as for example, in a root-abscess, could be carried to remote parts of the body and there set up new disease-processes. Immediately entered the dentistry of the present, in which all dental operations must be viewed in the light of their effect on the general health of the patient. This period made necessary a different type of assistant, one whose pre-

[1]Associated with Dr. J. A. Bliss, Sioux City, Iowa.

liminary education was better, whose interest in the welfare of the patient was sincere and professional, and who was capable of studying professional problems. Her responsibility has come to be akin to that of the medical nurse, for to her has been delegated such important matters as the sterilization of instruments and materials, and the practicing of proper surgical cleanliness, where the nature of the operation makes this necessary.

It is under such conditions that we are practicing. We see the profession dividing into specialties so varied that each of us can seek to serve the one that best suits our talents and capabilities. To us has been given the privilege of doing our part in restoring patients to health and in maintaining that health. Greater still is the privilege we have, thru children's dentistry, in helping the little ones who come under our care, from ever knowing the pain and loss of health that has been the lot of their less fortunate parents. The opportunity to do good is so manifest that the assistant who deserves the name cannot fail to be stirred by a great and deep enthusiasm.

And when the dentistry of the future arrives—and it will soon be here—what does it hold for us? Think of what dentistry will be, when practiced as a medical specialty. Then the first question we will ask ourselves will be, "What can be done to restore this patient to health, to conserve that health, and to prevent recurrence of disease?" When that day arrives, much more will be demanded of us as assistants than is now demanded. Will me meet the demand? That depends on us individually, on how much we are willing to contribute in the way of study and of sincere effort. The importance of the dentistry of the future will be so great that the public we serve will demand these things of us. If we meet that demand, we may rest assured that our reward will be ample; and we may be just as sure that if we fail to rise to our opportunities, there will be others more worthy who should and will take our places. Already we see the type of assistant changing. Preference is being given to those of superior general education, and in certain of the specialties in dentistry the medically trained nurse is taking her place. It seems only logical to hope, in this connection, that schools will be established for the training of assistants in the fundamentals of their work, thereby relieving the individual dentist from the labor of giving such instruction, as is now the case.

The opportunities for the energetic, ambitious assistant are unlimited. Let us resolve to do our best to help and encourage the sincere dentists with whom we are associated in this great work for the health and happiness of our patients.

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Editor and General Manager,
OTTO U. KING, D.D.S., F.A.C.D., 127 N. Dearborn St., Chicago, Illinois.
Associate Editors,
THOMAS P. HINMAN, D.D.S., F.A.C.D., Atlanta, Ga.
HARVEY J. BURKHART, D.D.S., LL.D., F.A.C.D., Rochester, N. Y.
THOMAS B. HARTZELL, D.M.D., M.D., F.A.C.D., Minneapolis, Minn.

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Editorial Department

THE AMERICAN COLLEGE OF DENTISTS

This body has for its object the establishment in dentistry of the same ideals that are represented in medicine by the American College of Surgeons. The preliminary organization took place at Boston in August, 1920, and it was perfected in Milwaukee in August, 1921. A statement of its objects, coming officially from its founders, is as follows:

"Every important profession, science or art has its Academy, Legion, or Court of Honor, to which are elected, or appointed, those who have

unselfishly devoted themselves to the advancement of each specific cause. This has been done not only as a just recognition of meritorious services, but also as an example to younger members that they may be encouraged to nobler efforts.

"Recognition of the need of a similar influence in dentistry has resulted in the establishment of the American College of Dentists. The object of this College is to bring together in a group the men of outstanding prominence in the profession and by their united efforts in a field that is not now covered by any dental agency to endeavor to aid in the advancement of the standards and efficiency of American dentistry. Some of the aims of the College are to cultivate and encourage the development of a higher type of professional spirit and a keener sense of social responsibility throughout the profession; by precept and example to inculcate higher ideals among the younger element of the profession, and hold forth its fellowship as a reward to those who faithfully follow such ideals; to stimulate advanced work in dental art, science and literature; and to honor men who have made notable contributions to the advancement of our profession.

"The enormously increased responsibilities of the dental profession to humanity on the one hand; the unprecedented opportunities for exploitation, which have resulted in a wave of mercenary practices that threatens to become a public scandal to the everlasting disgrace of American dentistry, on the other hand, demand that those elements of the profession, whose character, reputation and professional attainments point them out as leaders, should be brought together for the purpose of checking the tide of destructive agencies and of encouraging by every laudable means the cultivation of that high spirit of professional and social responsibility, the wholesome influence of which is so greatly needed.

"Inasmuch as there is no title or mark of distinction to differentiate the recent graduates from the practitioner who has devoted many years of faithful effort in the upbuilding of his profession, it is proposed that the fellowship of the College shall be conferred upon two groups of practitioners, viz.:

"1. Upon those members of the profession who have been at least ten years engaged in the practice of dentistry, whose efforts during that time have been loyally devoted to its advancement, and who are unquestionably looked upon as leaders in their respective communities. Time and effort devoted to teaching in dental schools, to presenting papers, or clinics, before dental societies, or to organization and executive work of a constructive character; as well as public services or civic duties having a tendency to enlarge the usefulness or the public appreciation of dentistry, shall be taken into consideration when passing upon candidates of this group.

"2. The conferring of the fellowship shall be held out as a stimulus to young

men to induce them to engage more earnestly in those activities which tend to advance dentistry as a profession and for which monetary remuneration must necessarily be sadly out of proportion to the time and effort expended. Devotion to teaching, especially in the non-clinical branches; to research work and to public education, as well as advanced work in the art, science or literature of dentistry, should be greatly encouraged as a consequence of this movement.

"The candidate for the fellowship in either class must be of good moral character, and have a reputation for ethical conduct and professional standing that is unquestioned. Personality, integrity, education, unselfishness, and high professional ideals, as well as freedom from mercenary tendencies, shall be considered in evaluating the qualifications of all candidates for the fellowship."

It will be seen by the foregoing that the ideals set by this organization are of the highest order, and if they are maintained—as undoubtedly they will be—membership in the College will be a coveted prize for which every progressive and earnest worker in dentistry will strive. It is a goal toward which the young man of unusual application and ability may legitimately aspire, and once having attained it he will receive added incentive to achieve greater and still greater things, to the end that the whole profession may be advanced, not only in its technical knowledge, but in its ideals as well.

Some such organization as this is needed in our profession to act as a stimulus to men both before and after graduation, that they may have something to look forward to beyond the mere acquirement of a college diploma, or a state board license to practice.

Dentistry has developed for the most part as the result of the impetus given it by men of outstanding enthusiasm and initiative—by a few men in fact—who have been impelled by the sheer force of their own genius and their inherent love of the work, without other incentive than the mere fact of doing it.

Now that this College has been organized it offers a means whereby original research or individual effort may be recognized in such a way as to constantly bring out the best there is in men, with the assurance that there is an authoritative medium for its recognition and an encouraging hand held out to sustain them.

It may be stated without breach of confidence that it is not the intention of the founders to build up the organization rapidly, nor to induce large numbers to seek fellowship at once. It is deemed the wiser and safer plan to proceed slowly and carefully, building along conservative and substantial lines which shall insure such an organization that men will eventually be proud to belong to it. Not that it is in any degree a closed corporation, nor that it is exclusive except in the fact that men must have achieved something to belong to it, and be willing to achieve

more. In fact it is wholly democratic in the sense that the humblest worker in the dental ranks may aspire to membership provided he evolves something of signal service to his profession or to humanity.

The American College of Dentists was not organized with any ulterior motive, but merely with the idea that it shall prove one more means of promoting advancement in dentistry, and adding attractiveness to study and application.

BREWERS AND NOT MEDICAL PROFESSION DEMANDING MANUFACTURE OF BEER

It is the height of absurdity for anyone to make out that beer or alcoholic beverages of any kind are a necessity for medical purposes, and it goes without saying that the present propaganda in that direction comes from the breweries and not from the medical profession. Even medical men who formerly used alcoholic beverages in moderation would not advocate it as a necessity in the practice of medicine. Of course we are compelled to admit that there are a few doctors who do not follow the straight and narrow path (even as there are preachers and priests who deviate from the narrow way) and who may be willing to "sell their birthright for a mess a pottage," but not all, and the medical profession as a whole has been injured in the eyes of the public because a few of its members have not the moral stamina to live up to the trust placed in them. Physicians, individually and collectively, should let it be known in no uncertain manner that this demand for the manufacture of beer and other malt liquors for medical purposes has not come from the medical profession, and that the medical profession as a whole is opposed to legalizing the manufacture of such in the name of medical therapeutics.—*Journal of the Indiana State Medical Association*, June 15, 1921.

1922 Meeting of the
National Dental Association
Los Angeles
July 17, 18, 19, 20, 21

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Institute of Dental Teachers, third week in January, 1922, at Montreal, Quebec. Abraham Hoffman, Secretary, 381 Linwood Avenue, Buffalo, N. Y.

STATE SOCIETIES

October

Virginia, at Richmond, (11, 12, 13, 14).

December

Ohio, at Columbus (6, 7, 8).

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

California, at San Francisco, College of Physicians and Surgeons, December 10. C. A. Herrick, Secretary, 133 Geary Street, San Francisco.

Connecticut, at Hartford, November 17, 18, 19. Robert H. W. Strang, Recorder, 886 Main Street, Bridgeport.

Iowa, at Iowa City, College of Dentistry, December 5. C. B. Miller, Secretary, 726 Fleming Building, Des Moines.

Kansas, at Wichita, December 12. G. F. Ambrose, Secretary, El Dorado.

Maryland, at Baltimore, College of Dental Surgery, November 9, 10, 11. F. F. Drew, Secretary, 701 N. Howard Street, Baltimore.

Michigan, at Ann Arbor, November 14. E. O. Gillespie, 745 David Whitney Building, Detroit.

New Jersey, at Trenton, December 5-9. John C. Forsyth, Secretary, 429 E. State Street, Trenton.

KANSAS STATE BOARD OF DENTAL EXAMINERS

The Kansas State Dental Board will meet in Wichita, December 12, beginning at 7:30 P. M. Headquarters at Hamilton Hotel. For further information write to

G. F. Ambrose, *Secretary*
El Dorado, Kan.

IOWA STATE BOARD OF DENTAL EXAMINERS

The Iowa State Board of Dental Examiners will meet for the purpose of examining candidates for a license to practice in Iowa, at Iowa City, College of Dentistry, beginning Monday, December 5, at 9:00 A. M.

For further information and application blanks, address

C. B. Miller, *Secretary*
726 Fleming Bldg., Des Moines, Iowa

MARYLAND BOARD OF DENTAL EXAMINERS

The Maryland Board of Dental Examiners will meet for examination of candidates for certificates at the Baltimore College of Dental Surgery, on November 9, 10, and 11, at 9:00 A. M.

For application blanks or further information, apply to

F. F. Drew, *Secretary*
701 N. Howard St., Baltimore, Md.

MICHIGAN DENTAL EXAMINATION

The next examination for candidates wishing to practice dentistry in Michigan will be held in Ann Arbor during the week beginning November 14. All credentials and fees must be in the hands of the Secretary not later than November 4. For application blanks write to

E. O. Gillespie
745 David Whitney Bldg., Detroit, Mich.

NEW JERSEY BOARD OF REGISTRATION

The State Board of Registration and Examination in Dentistry of New Jersey will hold their regular examination at Trenton, New Jersey, December 5 to 9, 1921. License fee, $25.00; re-examination fee, $10.00.

Practical tests required: Insertion of an

approximal gold filling with the approximating tooth in position, compound approximal amalgam filling, and a silicate filling; candidate must furnish his own patient. Taking of impressions, bite, selection of teeth, articulation, trial plate; candidate must furnish his own patient. Practical examination in mouth diagnosis.

Attention is directed to the following quotation from the dental law of New Jersey: "Applicant shall present to said board a certificate from the commissioner of education of this state, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study, or the equivalent thereof." In accordance with this law the secretary will issue application blanks only upon presentation of the required certificate from the Commissioner of Education, State House, Trenton, New Jersey.

Applications must be filed, complete, ten days before the date of the examinations. Address all communications for further particulars to

JOHN C. FORSYTH, *Secretary*
429 E. State St., Trenton, N. J.

THE CONNECTICUT DENTAL COMMISSION

The Dental Commissioners of Connecticut will meet at Hartford, Connecticut, November 17, 18 and 19, 1921, to examine applicants for license to practice dentistry, to examine dental hygienists for license to practice, and to transact any other business proper to come before them.

For further information, address

ROBERT H. W. STRANG, *Recorder*
886 Main St., Bridgeport, Conn.

CHICAGO DENTAL SOCIETY'S ANNUAL CLINIC

The annual clinic of the Chicago Dental Society will be held at the magnificent new Hotel Drake, January 19, 20, 21, 1922.

This hotel is peculiarly well adapted to the needs of a large sectional meeting, like the one planned for this occasion. Many commodious sound-proof rooms will be provided for the lectures and demonstrations, while the space for the general sessions and exhibits will meet all requirements, and is ideal in every particular.

The program, which will be announced at a later date, will surpass anything yet attempted.

For convenience, out-of-town guests should make their reservations at the Drake, and they should be made as early as possible. All National Dental Association members are cordially invited.

Further information will be given by addressing,

M. M. PRINTZ, *Secretary*
25 E. Washington St., Chicago, Ill.

ANNUAL MEETING OF ASSOCIATION OF MILITARY DENTAL SURGEONS

The Association of Military Dental Surgeons held its annual convention in Milwaukee in conjunction with the twenty-fifth anniversary of the National Dental Association. General M. W. Ireland, surgeon general of the Army, and Colonel R. T. Oliver, in charge of the dental division of the surgeon general's office, attended. General Ireland delivered an address and was elected an honorary member of the National Dental Association, being the fourth to receive such a distinction in the history of that organization. The election of officers of the Association of Military Dental Surgeons resulted as follows: Lieutenant Colonel R. P. McGee, Army D. R. S., president; Commander George H. Reed, U. S. Navy, vice-president; Lieutenant Colonel Frank P. Stone, U. S. Army, secretary and treasurer; and Captain W. D. Vail, U. S. Army, editor and business manager. The two new members of the executive council elected on this occasion were Colonel R. T. Oliver, U. S. Army, who has been president of the association for two years, and Lieutenant Commander J. L. Brown, U. S. Navy. —*Army and Navy Register*, September 3, 1921.

A WONDERFUL TRIP

Caravan Director Joseph P. McCann is already working on a water trip to the Imperial Council at San Francisco next June. It is too early as yet to plan a complete itinerary, but the tentative plans include a departure from New York, a voyage thru the canal, touching at Nassau, Cuba, perhaps Porto Rico and other Atlantic stops, the canal passage, a visit on the Zone, where Abou Saad promises to make us more than welcome, a trip up the west coast to San Francisco, then to Honolulu with the flotilla, a visit to Aloha temple, a return to San Francisco and then a trip by train across country or possibly a choice of the rail or water route. It will be the most wonderful trip ever planned for a Shrine excursion and already Noble McCann has a lot of applications on file, one temple having bespoken one hundred reservations.

If you are interested, better write McCann

at once and get your communication on file, for there will be but one steamer and it will be strictly first come, first served. Joe's address is 1328 Broadway, New York City.—*The Meccan.*

DENTAL CORPS ORDERS FROM WAR DEPARTMENT

Navy

Lieutenant W. F. Murdy, Pittsburgh; to Kansas.—*Army and Navy Register*, September 3, 1921.

Lieutenant C. A. Angonnet, to naval training station, San Francisco.—*Army and Navy Register,* September 10, 1921.

Lieutenant B. F. Sweeney, R. S., New York; home, resignation accepted.

Lieutenant (J. G.) R. R. Cress, to navy yard, Mare Island.

Lieutenant E. M. Kenyon, navy yard, Philadelphia, Pa.; to Dixie.

Lieutenant C. E. Morrow, Dixie; to navy yard, Philadelphia, Pa.

Lieutenant F. A. Batkin, naval training station, San Francisco; to Beaver.

Lieutenant J. W. Bourquin, Beaver; to R. S., San Francisco.—*Army and Navy Register,* September 17, 1921.

Lieutenant F. V. Davis, Minnesota; to Connecticut.

Lieutenant Hyman Mann, Connecticut; to Minnesota.—*Army and Navy Register,* September 24, 1921.

Army

Captain Herman J. Lambert, from duty at Camp Meade, Md., to Fort Washington, Md., for duty.

Captain Arthur T. Burchill, now on temporary duty at Key West Barracks, Fla., relieved from duty at Camp Jackson, S. C., and report at Key West Barracks for duty.

Captain Clarence J. Wright, report to retiring board at Washington for examination.

First Lieutenant Harry T. Ostrum, honorably discharged with one year's pay.—*Army and Navy Register,* September 3, 1921.

Captain Clement J. Gaynor, from duty at Fort Worden, Wash., about September 20 to Fort Leavenworth, Kan., for duty.—*Army and Navy Register,* September 10, 1921.

Major Thomas L. Smith from duty at Fort Moultrie, S. C., to Camp Benning, Ga., for duty.

Major Chester Denham, Captains Alexander M. Smith, Jr., Roy A. Stout to San Francisco and about November 12 to Hawaiian Department for duty.

Captains John N. White, Walter A. Rose from duties at Camp Jackson, S. C., to Camp Benning, Ga., for duty.—*Army and Navy Register,* September 17, 1921.

Captain Alvin E. Anthony from duty at Camp Grant, Ill., to Fort Des Moines, Iowa, for duty.

Captain Wayne W. Woolley from duty at Camp Grant, Ill., to Fort Riley, Kans., cavalry school for duty.—*Army and Navy Register,* September 24, 1921.

List of applicants who have accepted appointmens in the Dental Reserve Corps: Major Frank Randall McCullagh, Boston, Mass.; First Lieutenant Thomas Rexford Allen, Chicago, Ill.; Captain F. W. Gale, La Grange, Ill.; Major C. R. Modie, Madison, Wis.; First Lieutenant A. B. Wigdahl, Decorah, Iowa.

The following have been granted leaves of absence from the Dental Corps of the Army: Captain Victor P. Klapacs, 2½ months about September 23; to leave United States October 1. Captain R. A. Stout, 2 months effective about October 1.

PATENTS OF INTEREST TO DENTISTS

1380880, Collapsible container, Albert L. Austin, Cleveland, Ohio.

1380633, Toothbrush marker, Elmer J. Brown, Rangeley, Maine.

1380530, Dental floss holder, Thomas W. Cook, Berkeley, Cal.

1380726, Dental forceps, William A. Lurie, New Orleans, La.

1380819, Artificial tooth, John E. Marriott, Latrobe, Pa.

1380875, Locking device for collapsible containers, Alexander L. Ward, New York, N. Y.

1381697, Handpiece for dental engines, Charles B. Bishop, New York, N. Y.

1381794, Anatomical articulator, Robert E. Campbell, Berkeley, Cal.

1381750, Dental device, Orin C. Samphere, West Allis, Wis.

1381672, Dental napkin holder, Wallace F. Shaw, Westfield, Mass.

1381521, Cell-diaphragm for X-ray apparatus, Sinclair Tousey, Westhampton Beach, N. Y.

1382459, Combined match and toothpick, Maurice Bercovici, Botosani, Roumania.

1382304, Artificial tooth, Archie T. McGuinness, San Francisco, Cal.

1382010, Apparatus for manufacturing porcelain jacket crowns, Chotoku Nishi, San Francisco, Cal.

Copies of above named patents may be obtained for twenty-five cents each, by addressing John A. Saul, Solicitor of Patents, Fendall Building, Washington, D. C.